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ABSTRACT

This curriculum guide is intended for educators who want to help young people become wise stewards of the environment and who believe that education about energy is an opportunity to achieve that goal. This guide aims to help educators in the curriculum planning process. This guide furnishes a visual overview of resources in chart format. Resources are grouped into categories of published resources and resource organizations. Entries are described in detail in listings under these headings. The resources chart is followed by two sections to aid in program planning. The first of these sections, "Choosing Resources for Energy/Environmental Stewardship Education", describes four interdependent sets of questions used to review the resources included in this guide. These questions pertain to environmental stewardship, energy/environment topics, education strategies, and user-friendliness. The Section following entitled "Energizing Your Youth Program," addresses key questions and concerns including designs for developing stewardship skills, age-appropriateness of concepts and teaching strategies, energy education opportunities for the 1990s, and where to turn for resources. Next are sections on published resources (materials for teaching, learning, and program planning; bibliographies and online information sources) and resource organizations. Final section guides the reader in how to access the 4-H Energy Education Resources Database. (PVD)

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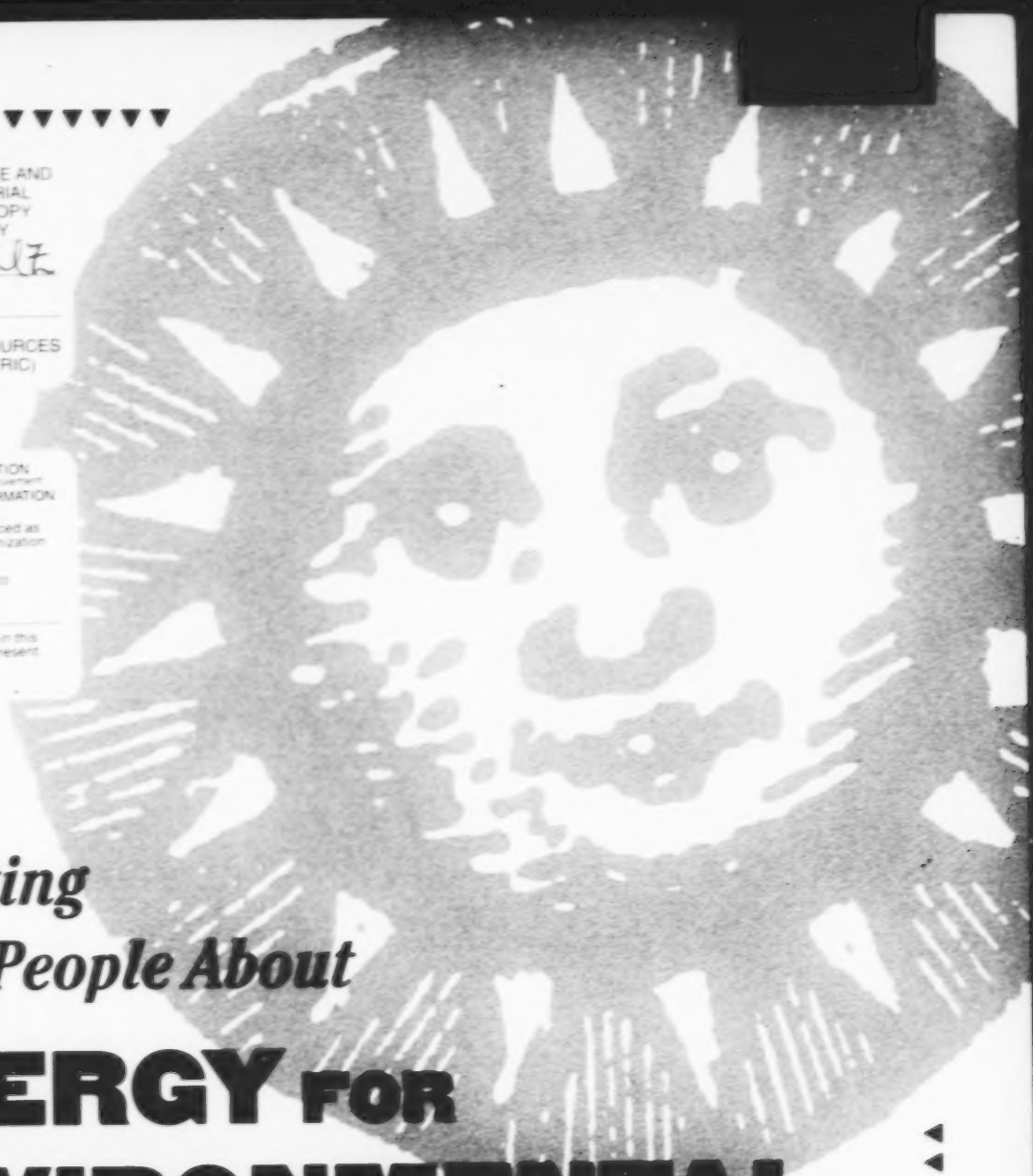

Educating
Young People About

ENERGY FOR ENVIRONMENTAL STEWARDSHIP

A Guide to Resources for Curriculum Development with an Emphasis on Youth-led, Community-based Learning

Will Snyder and the 1994 National 4-H Energy Education Review Team

Sponsored by the United States Department of Agriculture-Extension Service, National 4-H Council, Amoco Foundation, and the University of Massachusetts Cooperative Extension System.

SE0030357

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September 1994

Dear Educator:

Energy is the GO and GROW and CHANGE of everything in our world – so much a part of our lives that we hardly give it a thought. The electricity that lights our homes and the gasoline that powers our cars are only part of the story. Energy is in the sprouting seed as it pushes through the soil, the calories in our breakfast, the products we buy, that bulging plastic garbage bag by the curb, the tides, the breeze, the falling rain, and above all, the light and warmth of the sun.

Teaching about energy offers a powerful set of tools for understanding environmental issues. Energy is the common currency that unites two economies: nature's and ours. Tracking the flow of energy reveals the far-reaching consequences of our everyday choices. We find the sources of many environmental problems, and potential solutions.

Young people can be resources for environmental problem-solving as they learn about energy. When we help them explore the real life energy connections in their community, environment, and personal lives, they learn to make wise choices. When we invite youth to participate in decision-making and action, the whole community can benefit from their knowledge, energy, and enthusiasm.

There are as many ways to teach about energy and the environment as there are creative educators. In its focus on **stewardship**, this guide highlights programming that emphasizes

- active, in-depth, project-based learning driven by youth interest,
- groups of young people learning together,
- participation in the community,
- the guidance and support of caring adults.

This printed guide, its accompanying electronic database of resources, and a brief *Report to 4-H* are the result of the 1994 4-H Energy Education Assessment, sponsored by the **4-H Environmental Stewardship Program.** A national review team representing diverse energy concerns, interests, and perspectives oversaw this project. A team of educators conducted the review. We believe that the resources listed here will be useful to educators who are committed to helping young people become wise stewards of the environment.

This guide builds on the strength of previous efforts and is indebted to the work of many people. We hope it will serve you well!

Will Snyder

Will Snyder
for the National Review Team

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Introduction

THIS CURRICULUM GUIDE is intended for educators who want to help young people become wise stewards of the environment, and who believe that education about energy is an opportunity to do this.

The goal of the guide is to help educators in the curriculum planning process.[1] The guide assumes that most energy education for environmental stewardship in the 1990's will be infused into existing curricula, hence our emphasis on "energizing" youth programs. However, the information here can also be used to design new programs focused on energy and the environment, where this is practical.

Who will find this guide useful?

This guide will be useful to all educators who have the opportunity to develop creative programs. This group may include:

- school administrators, curriculum coordinators, and teachers
- environmental club advisors
- 4-H and other youth development program specialists
- camp directors
- after-school program directors
- community service coordinators
- student leaders working with adult advisors

(1) The term "curriculum" is used here to refer broadly to all the planned learning in an educational program. Every educational endeavor, formal or nonformal, has a curriculum, though some are more clearly articulated than others. The most useful and effective curricula specify teaching methods as well as subject matter.

How to use the guide

For a quick overview and comparison of key resources:

see A Quick View of Resources, page 5

For in-depth description of resources, and ordering information:

see Published Resources, page 29

Resource Organizations, page 41

Accessing the 4-H Energy Education Resources Database, page 47

For guidance in program planning:

see Choosing Resources for Energy/Environmental Stewardship Education, page 11

Energizing Your Youth Program, page 17

Published Resources, page 29

Resource Organizations, page 41

This guide is not . . .

- **a comprehensive listing of energy and environmental education materials.** See page 38 for bibliographies and ongoing review efforts. The electronic database described on page 47 also includes a wider range of resources than this guide.
- **a definitive rating of materials.** This guide features resources we found that match closely the national review team's criteria for educating young people about energy for environmental stewardship. No judgment about any other education programs and materials should be inferred.
- **a recipe for an energy program.** The goal is to spark your own creative ideas by offering tools and suggesting ingredients. YOU are the foremost expert on the educators and youth you work with, and the community you work within.

Help us find what's missing

If you are aware of materials and organizations not listed here that meet this review's criteria for energy and environmental stewardship education – emphasizing youth leadership and appropriate for active, community-based learning – please let us know! Contact

Environmental Stewardship Program
National 4–H Council
7100 Connecticut Avenue
Chevy Chase, MD 20815
301/961–2913

A Quick View of Resources

THE FOLLOWING SIX PAGES present a quick visual overview of resources identified by this review that will be useful in developing energy/environmental stewardship curricula. For an explanation of column headings, see Choosing Resources for Energy/Environmental Stewardship Education (page 11).

This chart format can help you put together a complete set of resources to develop your program. Resources are grouped into two categories: Published Resources (pages 6-9) and Resource Organizations (page 10). Entries are described in more detail in listings under these headings beginning on pages 29 and 41.

Materials for teaching, learning, and program planning[1]

Title	Main Emphasis	Grade Level	Subject Areas[2]	Learning Environments[3]	Lesson Types[4]	Includes Program planning advice	1994 Cost	Developing Environmental Stewards: Ecological Foundations	Nature of Environmental Issues	Investigation Skills	Evaluation Skills	Skills for Action in Personal Life	Citizen Participation Skills	Application to Home/ Community Issues
Atlanta Student Audit Program (ASAP)	technical energy audits	9-12+	s, v	c, sy	d, r, fo, cp	*	■			◉	◉	○	○	◉
Campus Ecology	environmental audits	9-12+	s, ss, v, la	c, sy, n	d, r, fo, cp	*	17.95			○	○		○	◉
Connections	appropriate technology	5-6+	la, ss, s	c, n, sy	d, w, de, fo, a		5.00	○	○					
Conserve and Renew	conservation and renewable energy	4-6+	la, m, ss, s, pe, mad	c, sy	d, w, g, dr		12.00	○	○			○		
Cooking with the Sun	building and using solar cookers	K-12	s, ss, v	c, sy	fo, m		7.95					◉		○
Energy Patrol	elementary student leadership in energy conservation	4-6	la, m, ss	c	d, fo	*	free					○	○	○
Energy Projects for Young Scientists	scientific understanding of energy	7-12	s, v	c, l	fo, l, m, h	*	10.00			○	○	○		○
Energy Skill Builders	energy readings and activities	5-12	la, ss, s	c, l	w, r, m, h		■	○	○	○		○		
Energy Sources and Natural Fuels	exploration of energy, photosynthesis, and fossil fuels	7-12	s	c, l	d, de, r, l		■			○				
Global Warming and the Greenhouse Effect	science and social impact of global warming	7-10+	ss, s	c, l	d, w, de, g, fo, l, dr		15.00	○	○		○		○	
The Growing Classroom	science and cooperative learning through garden projects	2-6+	la, m, ss, s, mad	c, ns, sy	d, w, g, dr	*	27.00	○		○		○		
Growing Greener Cities	ecologically-sound urban tree plantings	6-12+	ss, s	n	de, fo, cp	*	7.95					○	○	○
Hot Water and Warm Homes from Sunlight	experiments with solar heating	4-8	s	c, sy	d, fo, m		10.00			○	○			
Investigating and Evaluating Environmental Issues and Actions	responsible citizenship and environmental issues	7-12	ss, s, la	c, n, ns	d, w, r, fo, cp	*	18.80		◉	○	○		○	◉
Junior Solar Sprint	building and racing solar-powered model cars	6-9+	s, v	c, sy	d, fo, l, m, fc		■		○	○				

[1] See Bibliographies and online information sources (p. 38) for additional resources

○ = covered in this resource

[2] **Subject areas: la** = language arts; **m** = math; **ss** = social studies; **mad**= music, art, drama; **s** = science; **l** = languages; **pe** = physical education; **v** = vocational education

[3] **Learning environments: c** = classroom or community facility; **l** = laboratory; **ns** = natural site; **n** = neighborhood; **sy** = schoolyard

Energy/Environment Topics											Education Strategies				User-Friendliness		
Energy Fundamentals			Energy Use				Energy Stewardship										
Nature of Energy	Energy Flow	Energy Sources	Energy and Me	Energy in the Economy	Energy and Technology	Environmental Impact	Energy Alternatives	Energy Policy	Individual Energy Choices		Experience-based Methods	Youth Development Emphasis	Community-based Approaches	Attention to Youth Diversity	Support and Guidance for Educators	Adaptability	Organization and Packaging
○	◎	○		○	○	◎	○	○	◎		○	○	○	○	○		
	○				○	○	○	○			○	○	◎	◎	○	○	○
	○	○	○	○	◎	○	◎		○			○	○	○	○	○	○
◎	○	◎	○	○	○	○	◎	○	○		○	○		○	○	○	○
					◎				○		◎	○		○	○	◎	○
				○							○	◎	○	○	○	◎	○
◎					◎	○					○	○		○	○	○	
◎	○	◎	○	◎	◎	○		○	○		○			○	○	○	○
◎	○	◎									◎			○			
○	○	○		○	○	◎		◎			◎	○		○	◎	○	◎
	○	○	○			○	○		○		◎	◎		○	○	◎	○
							○	○	○				○	○	○	○	○
○		○	○		○						○	○		○	◎	○	◎
											○	○	○	○	○		
◎		○	○	○	◎						◎	◎	◎	○	○	○	○

◎ = exceptional coverage or unique approach ■ = see listing for cost details

[4] **Lesson types: d** = discussion/sharing/debate; **w** = worksheets/puzzles; **de** = demonstrations/lectures; **a/v** = audio/visual materials; **r** = reading/writing; **g** = games; **c** = computer work; **fo** = field observation/measurements; **l** = laboratory experiments; **dr** = drama; **m** = model building/artwork; **cp** = community projects; **fc** = fairs & contests; **h** = home projects/observations

Materials for teaching, learning, and program planning[1] (continued)

Title	Main Emphasis	Grade Level	Subject Areas[2]	Learning Environments[3]	Lesson Types[4]	Includes Program Planning Advice	1994 Cost	Developing Environmental Stewards: Ecological Foundations	Nature of Environmental Issues	Investigation Skills	Evaluation Skills	Skills for Action in Personal Life	Citizen Participation Skills[5]	Application to Home/ Community Issues
The Kid's Guide to Social Action	participation skills for community issues	5-12	la, ss, s	c, n	d, cp	*	14.95		○	○	○		◎	◎
Learning About Plants (LEAP)	elementary life science	1-6	s	c, sy	de, g, fo, l		15.00/ grade	◎	○					
Let's Get Energized	fun activities for nonformal settings	K-6	la, m, ss, mad, s, pe	c, sy	d, g, fo, dr, m, fc		free							
Living Lightly in the City vols I & II	environmentally sound lifestyle choices	K-3; 4-6	la, m, ss, s, mad	c, ns, n, sy	d, w, g, fo, dr, cp		19.00 each	◎	◎	○	○	○	○	○
Living Lightly on the Planet vols I & II	understanding society's environmental choices	7-9; 10-12	la, ss, s	c	dr, r, g, d		19.00 each	◎	◎	○	◎	○	○	
Manipulative Energy Activities	experiments with energy and energy conservation	4-6; 7-8	s, ss	c, sy, l	de, g, fo, l, m		free			○	○			
National Energy Education Development (NEED) Project	energy sources, conservation, youth leadership	4-12	la, m, ss, mad, s	c, l	d, w, m, de, av, g, l, dr, fc	*	25.00 membership		○		○	○	◎	○
NoodleHead Network videos	youth as spokespersons, videos with a message	5-12	la, mad, ss, s	c, ns, n	d, av, dr		175.00						◎	○
Poster Power posters	energy information in poster form	K-6	la, ss, s	c	d, av		3.00 each							
Project Learning Tree Environmental Education Activity Guide	experience-based environmental education	K-8	la, m, ss, mad, s, pe	c, ns, n, sy	d, de, g, fo, dr, m	*	■	◎	◎	○	○	○	○	○
Science Activities in Energy	simple energy experiments	3-12	s	c, l, sy	d, fo, l, m		free			◎				
Science Projects in Renewable Energy and Energy Efficiency	ideas and resources for science projects	4-12	s, v	l, sy	fo, l, m	*	10.00			○	○			
Sunship Earth	conceptual understanding of environmental process	5-6±	la, s, mad	ns, sy, c	d, de, g, fo, dr	*	14.95	◎	○			○		
The Simple Act of Planting a Tree	organizing community tree-planting projects	6-12+	ss, s, la	n	de, fo, cp, fc	*	12.95		○				◎	◎
The Universal House	basic principles of energy efficiency in Native American homes	4-6+	la, m, ss, s	c, n, sy	d, de, av, fo, m		free	○		○				

Energy/Environment Topics											Education Strategies				User-Friendliness		
Energy Fundamentals			Energy Use				Energy Stewardship										
Nature of Energy	Energy Flow	Energy Sources	Energy and Me	Energy in the Economy	Energy and Technology	Environmental Impact	Energy Alternatives	Energy Policy	Individual Energy Choices		Experience-based Methods	Youth Development Emphasis	Community-based Approaches	Attention to Youth Diversity	Support and Guidance for Educators	Adaptability	Organization and Packaging
								○			◉	◉	◉	○	○	○	○
◉	◉	◉	○								○			○	◉	○	○
○		○	○		○							○		○		◉	◉
○	◉	○	◉	○	◉	○	○	○	○		◉	○	◉	◉	○	◉	○
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	○		◉	○	○	○	○	○	○		○	◉	○	○	◉	◉	○
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								○	○		○	○	◉	◉	○	◉	○
◉		◉		◉	○	○					◉	○		◉	○	○	○

Resource Organizations*

Organization Name	Primary Focus	Regional Emphasis	Information for the General Public	Teaching/Program Planning Materials	Workshops/Institutes for Educators	Networking and Resource Sharing
American Forests	forest conservation, including energy and urban forestry		❍	❍	❍	
Bullfrog Films, Inc.	films and videos for environmental education		❍	❍		
Edison Electric Institute	public education through electric utilities		❍			
Energy & Environmental Alliance	resources for educators	Florida		❍	❍	❍
Energy Educators of Ontario	curriculum materials for classroom teachers	Ontario, Canada		❍	❍	❍
Energy Efficiency and Renewable Energy Clearinghouse (EREC)	renewable energy information		❍	❍		
Habitat for Humanity	voluntary service, housing		❍			
League of Women Voters	citizenship, public affairs		❍	❍		
National Consortium for Environmental Education and Training (NCEET)	environmental education assistance			❍	❍	❍
National Center for Appropriate Technology	appropriate technology assistance		❍	❍		❍
National Energy Foundation	energy education			❍	❍	
National Network of Energy and Environmental Education Professionals	networking, professional development			❍	❍	❍
National Science Teachers Association	science teaching resources			❍	❍	❍
New York Science, Technology, and Society Education Project	energy and technology education	New York		❍	❍	
North Carolina Alternative Energy Corporation	alternative energy	North Carolina	❍	❍		
Rocky Mountain Institute	sustainable development		❍			
Tennessee Valley Authority	regional development	Tenn. Valley	❍	❍	❍	

* see also Using Local Resources (page 28) and information on **U.S. Department of Agriculture – Extension Service/4-H** (page 44) and **U.S. Department of Energy** (page 43).

Choosing Resources for Energy/Environmental Stewardship Education

STEWARDSHIP is a word rich with historical and cultural meanings. It implies an ethic of care and responsible action for both the human community and the environment.

The national review team that advised this project believes that such an ethic is essential for future environmental quality, and human quality of life, on Earth.

We also believe that such an ethic should not–indeed cannot–be imposed on young people. It must grow out of their own experience of the natural world and their interactions with their human community.

The premise of this guide is that we have an opportunity and a responsibility to nurture the knowledge, sensitivities, and skills that will allow young people to develop and practice an environmental ethic for the future.

The resources included in this guide and its associated electronic database were reviewed using four interdependent sets of questions:

Environmental stewardship – Do the materials help educators to help youth move from awareness to responsible action? Do youth have a chance to gain not only environmental sensitivity and knowledge, but to practice their skills on real environmental issues?

Energy/environment topics – Do the materials help educators treat energy holistically as an economic and environmental stewardship issue? Do they address a range of energy and environmental topics? Do they address basic principles of physical, earth, and biological sciences?

Education strategies – Are the materials useful for experiential learning programs that involve the wider community in youth education? Do the materials empower youth to take the lead in their own learning? Do they promote critical and creative thinking?

User–Friendliness – Are the materials well-organized, adaptable, and easy to use? Do they provide adequate support and guidance for nonformal educators who may not have special training or knowledge?

The next four pages outline each of these criteria in more detail.

> *"Land, then, is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants, and animals. . . ."*
>
> *"We abuse the land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect. There is no other way for land to survive the impact of mechanized man, nor for us to reap from it the esthetic harvest it is capable, under science, of contributing to culture."*
>
> **Aldo Leopold,** *The Land Ethic and Sand County Almanac*, 1948

Developing Environmental Stewardship

The first and most important set of questions in this review asks whether a resource could contribute to helping youth become stewards of energy and the environment. This portion of the review draws on work done in recent years to develop a definition of "environmental literacy" that will be useful to educators.[2]

While there is no simple formula for this process, there are some basic sequential steps that are important in the development of environmentally literate citizens.[3] These include

- laying a foundation in ecological concepts and appreciation for the role of human values in environmental issues,
- developing skills for careful investigation and evaluation of issues and alternatives,
- developing skills for effective individual and collective decision-making and action on environmental issues.

Few educational materials encompass this complete process. However, many are still excellent resources that can contribute to the process. The charts on pages 6-9 give a quick overview of where each resource concentrates, and how different resources can complement each other.

Experience shows that it is possible for a person to be aware and knowledgeable about environmental issues but not care to act on that knowledge. It is also possible for a person to take environmental action based on concern, without a clear understanding of the issue. An environmentally aware person's actions may also be ineffective because of limited action skills or knowledge of action strategies.

The emphasis in developing environmental literacy is on putting all the components–awareness, concern, knowledge, and skills–to work, together, in effective action. All the steps outlined in questions below, in rough order, are important to this process.

(2) For a discussion of environmental literacy, see Charles E. Roth, "Environmental Literacy: Its Roots, Evolution and Directions in the 1990s." Educational Resources Information Center (ERIC), 1992. See ERIC access information on page 38.

(3) For a discussion of these steps, see Harold R. Hungerford et al., *Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules*, Teacher's Edition, Stipes Press, 1992. See page 32.

Do The Materials

Introduce the *ecological foundations* of energy/environmental issues?

explore the *nature of environmental issues*, including

- the effects of human values and actions on the environment?
- the potential for resolving environmental problems through individual and collective human action?
- the need for thorough investigation and evaluation of issues before action?

develop *skills for investigating issues*, including opportunities to

- formulate hypotheses, design and perform tests?
- shape questions, gather information, identify stake holder values and techniques of persuasion?
- revisit hypotheses and continue to seek new information?

develop *skills for evaluating potential solutions*, with opportunities to

- evaluate the social and ecological implications of alternate solutions?
- evaluate scientific evidence?
- evaluate claims by competing stakeholders?
- clarify personal values and revise positions given new information?

develop *skills for action in personal life*, such as

- household conservation practices?
- waste management?
- simple repairs?
- consumer research?
- managing land and natural resources?

develop *skills for community participation and citizenship*, such as

- effective communication?
- consensus building, negotiation, mediation?
- consumer action?
- involvement in politics and policy-making?
- education?

offer guidance in *applying knowledge, skills, and values to real environmental issues* in home and community?

Energy/Environment Topics

The second set of questions in this review asks whether the materials addressed key topics relating to energy and the environment. The emphasis is on treating energy holistically as an ecological and economic issue.

The following topics were identified by the national review team as important for teaching about energy for environmental stewardship. They are not presented as a fully developed conceptual framework for energy/environmental education.

Energy Fundamentals

Nature of Energy

- forms and characteristics of energy
- energy transformations
- entropy and system efficiency
- net energy (it takes energy to produce usable energy)
- measuring energy

Energy Flow

- energy flow in natural systems (photosynthesis, the water cycle, food webs, wind, tides, and water currents)
- energy flow in technological (human-made) systems (machines, manufacturing, transportation, life cycles of products)
- energy flow between natural and technological systems

Energy Sources

- the sun as Earth's ultimate energy source
- food as an energy source
- renewable and nonrenewable sources
- conservation/efficiency as an energy source

Energy Use

Energy and Me

- getting around (transportation)
- keeping comfortable (heating, cooling)
- enjoyment (tv, stereo, recreation)
- eating

Energy in the Economy

- ways of producing and distributing energy
- ways of using and conserving energy
- energy costs (including long-term environmental effects)

Energy and Technology

- understanding technology in everyday life
- historical perspectives on energy use
- energy systems in other countries and cultures
- recent developments and future technology

Environmental Impact

- ways of auditing energy use and assessing environmental impact
- environmental impact of different lifestyles and technologies
- comparing impact of renewable and nonrenewable energy sources
- assessing conservation potential

Energy Stewardship

Energy Alternatives

- recognizing the difference between needs and wants
- the concept of appropriate technology
- the concepts of sustainability and development

Energy Policy

- how society makes energy choices
- roles of different levels of government
- roles of individuals, citizen groups, and businesses
- the role of the media in informing opinion
- environmental justice and equity
- potential for conflict arising from different political, social, regional, and cultural perspectives
- community energy planning and development

Individual Energy Choices

- jobs and careers relating to energy and the environment
- opportunities for community service
- citizenship responsibilities
- business and investment choices
- eco-management (energy choices in garden, farm, range, and woodlot management)
- lifestyle choices
- household management

Learning Through Experience

Learning that occurs through designed experiences and reflection on those experiences has been a theme in American education since the early 20th century. Many *experiential education* programs have emphasized the development of positive attitudes and work skills through hands-on learning, with the aim of developing productive, resourceful members of society. Cooperative Extension's 4-H youth development programs, for example, have stressed youth involvement in self-directed, in-depth projects in community settings as a way to develop practical knowledge and life skills.

Recent research in cognitive psychology has also suggested an important role for experience in learning. According to *constructivist learning theory*, learners do not come to a lesson like empty vessels to be filled. They bring previous knowledge and a sense of value and meaning, which they apply to new things to be learned. To really learn, according to this theory, learners must interact with new concepts in depth. They must grapple with ideas, manipulate physical objects, experiment with processes, and reflect on these interactions in light of their own previous experience and understanding. Learning occurs as the learner incorporates this new knowledge into his or her existing knowledge frameworks, or constructs new frameworks. [4]

(4) For a summary discussion of this research, see Lauren B. Resnick and Michelene T. H. Chi, "Cognitive Psychology and Science Learning" in *Science for the Fun of It: A Guide to Informal Science Education*, Washington, D.C.: National Science Teachers Association, 1988.

(5) In *Curriculum Development for Issues Programming: A National Handbook for Extension Youth Development Professionals*, available from Extension Service-U.S. Department of Agriculture (see page 44). The National Criteria for Youth Development Curricula, intended to clarify goals and set standards for experiential education offerings, were in final draft form as this publication was written. The 4-H program aims to evaluate existing 4-H curricula for national distribution using these criteria. 4-H aims to develop programs around issues important to youth in their communities, and to reach out to audiences diverse in race, gender, culture, physical ability, and economic status.

(6) Most notably the American Association for the Advancement of Science's Project 2061 in science education, which calls for changes in teaching based on constructivist theory. See *Benchmarks for Science Literacy*, by the AAAS, New York: Oxford University Press, 1993. Reformers are encouraging an emphasis on active, project-based learning that resembles the curricula of some nonformal education programs.

Education Strategies

The third set of questions in this review addresses a critical but often overlooked aspect of the curriculum: HOW we teach.

We educate our youth not only in school but through family, community, the media, and religious institutions. Young people learn from everything they do, and what they learn from a planned lesson is never exactly what the teacher intended.

These considerations are particularly important in environmental education. Key components of environmental literacy are not easily learned in the traditional classroom. Active, community-based education that emphasizes youth development can offer an important complement to classroom approaches in reaching stewardship goals. Recent education reform efforts (see box to left) offer some encouragement for such hands-on, real world approaches.

This review of educational strategies is based on the 1994 National Criteria for 4-H Youth Development Curricula[5], and informed by current approaches to school reform[6]. The review asks four sets of questions:

Experience-Based Methods

Do the materials and activities

- emphasize ideas and skills that are meaningful in the learners' lives?
- use learners' questions and concerns as a starting point?
- introduce concepts through experiences?
- include opportunities to reflect on experience and apply new knowledge?
- provide for a result or product that demonstrates the concept learned, and provides an intrinsic reward for the learner?

Youth Development Emphasis

Do the materials and activities

- encourage youth leadership in the learning process?
- suggest a variety of experiences for varied learning styles and developmental levels?
- incorporate the teaching of life skills, such as communicating, working in groups, and managing resources?
- encourage an atmosphere of respect for different opinions and openness to new ideas?
- promote appreciation of cultural diversity in the learners' community and worldwide?
- promote a sense that learners can make a difference in the world?

Community-Based Approaches

Do the materials and activities

- encourage the involvement of the learner's family?
- inspire learners' exploration of their communities?
- recommend the involvement of community adults as resources?
- invite youth participation and leadership in community concerns?

Attention to Youth Diversity

Are the materials

- relevant in content and appropriate in language, illustrations, and examples for audiences diverse in gender, socioeconomic class, culture, and physical ability?

User-Friendliness

The final set of criteria in this review deal with how easy-to-use the materials are. These considerations are especially important for the teacher who has little time, the nonformal educator who has no special training or knowledge of the subject, or the camp counselor who may use the materials outdoors.

User-friendliness criteria are grouped into three categories:

Support and Guidance for the Teacher/Leader

The materials include

- a conceptual framework
- a table of contents
- a statement of goals and objectives
- adequate background information
- a guide to additional (especially local) resources
- suggestions for evaluating learning

Adaptability

The activities

- can be conducted without special training or knowledge
- can be easily used to supplement existing curricula
- can stand alone
- are adaptable to urban teaching environments
- include suggestions for variations and extensions

Organization and Packaging

- The organization of the materials is clear and uncomplicated
- Instructions for activities are short and simple
- Required preparations are simple and time efficient
- Materials are packaged for portability
- Materials are long-wearing
- Required special resources are packaged with the materials
- Other required equipment is inexpensive and easily obtained
- The layout and graphics are pleasing, readable, and photocopyable

Energizing Your Youth Program

WHAT ARE THE IMPORTANT CONSIDERATIONS for including energy and environmental stewardship in your youth program? This section addressess several key questions and concerns, including designs for developing stewardship skills, age-appropriateness of concepts and teaching strategies, energy education opportunities for the 1990's, and where to turn for resources.

> *"It is becoming increasingly apparent that our present environmental crisis is evidence of a prior failure of mind and perception - which is to say, a failure of education. The loss of species, topsoil, rainforests, and impending climate change are not primarily technological problems or even economic ones. They are first and foremost problems rooted in how we think about the world we inhabit."*
>
> **David Orr,**
> Foreword to
> *Campus Ecology*

What program qualities are most likely to produce responsible stewards of natural resources and the environment?

Programs are more likely to produce thoughtful, active environmental stewards if they:[7]

Provide youth with opportunities to investigate environmental issues, evaluate alternate action strategies, and carry out solutions. Knowledge of action strategies and skill in using them are the two strongest predictors of behavior associated with environmental stewardship. The best way to gain such knowledge and skills is through experience and practice.

Emphasize the development of strong, caring relationships between youth and adult leaders who show empathy for youth and for the environment. Research suggests that persons who grow up with strong relationships with adults who display environmental sensitivity–a concerned and understanding view of the environment–may develop this quality themselves. Nonformal education programs often provide good settings for such relationships to develop.

Explore the issues that learners view as most critical, and provide them with action skills that are likely to show positive results. Young people who see that their actions can make a difference on matters of importance to them will be more likely to act than those who feel they can exert no influence.

(7) The first six of these seven items are based on "Achieving Literacy–What's Involved," pp. 4-9 in Hungerford et al., Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules, Teacher's Edition, Stipes Press, 1992 (see page 32)

Encourage young people to explore one issue in depth. Superficial knowledge of a variety of environmental issues is generally not enough to motivate environmentally responsible behavior. However, youth often become highly motivated to act responsibly when they have investigated an issue enough to develop a sense of "ownership" and expertise.

Respect the complex and diverse beliefs and values held by young people. Attempts to indoctrinate youth with a particular set of values are not only unethical but educationally unsound. The role of educators in a democratic society is to help young people become skilled investigators and evaluators of environmental problems who can reexamine values and beliefs in the light of new evidence and conditions.

Provide youth with firm grounding in the ecological concepts needed to understand environmental problems. Ecological science offers the tools for understanding interrelationships in the environment that are critical to developing successful solutions. Of course, scientific understanding of ecology is imperfect and incomplete. Experts often disagree, especially on issues at the forefront of environmental science. In these cases young people, like adult citizens, must decide whether to act on imperfect knowledge or not to act and risk a worsening situation. Knowledge of history and culture, and understanding of political, economic, and social factors can help young people weigh these questions.

Include an element of FUN! Environmental issues can be sobering, even overwhelming. Environmental education programs must include a dose of lightheartedness for balance. Fun is especially important in nonformal settings, where participation is its own reward. Although difficult to define, fun is easy to identify in practice. Learners are actively engaged, fully absorbed, and excited. Smiles are frequent. Participants leave tired but satisfied. Difficulty, challenge, and risk–in the right amounts–are important ingredients. Fun activities also engage our imaginative, playful side, which may lead to more creative problem-solving. Designing a fun program requires knowing the interests of the particular group of young people.

What program formats offer good opportunities for including environmental stewardship education?

Residential camps – Living together 24 hours a day, in a community spirit and often in a natural setting, offers tremendous learning opportunities for youth of all ages. Through everyday life campers can learn about energy flow and transformations in natural and technological systems, monitor energy use, take energy action and see results.

Day camps and after-school programs – These programs usually involve elementary age children, and often include older youth as counselors. Children usually participate for only a few hours a day, and groups may not be consistent, but this setting offers opportunities for fun awareness activities and some ongoing group projects. Leading these activities can motivate youth counselors to learn more about energy, as well.

Youth groups – 4-H clubs, scout troops, school environmental clubs and community service programs offer the best opportunity for involvement in long-term, community-based investigation and action projects with real youth leadership. Such programs can take full advantage of youth interest in peer teaching. A youth group's project does not have to be focused on energy, or even on the environment, to include significant energy content: What is the energy impact of a woodworking hobby or a 4-H animal science project? Can an energy audit make the county fair more environmentally friendly?

School enrichment – Classroom teachers, especially at the elementary level, are often able to infuse energy and environmental topics into the curriculum. Recent school reform efforts may expand opportunities at the middle and high school levels, as well. Far-sighted school systems are moving to modify schedules, class size, and curricula to accommodate project-based, in-depth, community-based learning. Teachers with subject matter expertise are changing their role from "information source" to "learning facilitator." Creative new assessment tools are making possible thorough and meaningful evaluation of this learning.

What are the keys to establishing successful community-based energy/environmental education programs?[8]

Successful programs . . .

- identify energy and environmental stewardship clearly and specifically in program goals and objectives.
- reflect community concerns and needs.
- use methods and content that combine youth developmental needs with community energy issues.
- identify and recruit long-term community partners and local institutional support.
- improve the program through ongoing evaluation.

(8) Adapted from Elaine Andrews, "Youth Water Education Programs: Keys to Success," University of Wisconsin Extension, unpublished, 1994.

(9) The ideas presented in this section are drawn from three sources:

Curriculum Development for Issues Programming: A National Handbook for Extension Youth Development Professionals, Extension Service–United States Department of Agriculture, 1992.

Benchmarks for Science Literacy, American Association for the Advancement of Science – Project 2061, New York: Oxford University Press, 1993.

A Guide to Curriculum Planning in Environmental Education, David C. Engleson, Wisconsin Department of Public Instruction, 1985.

At this writing, there are efforts underway in several states (including Massachusetts) to develop outcome-based goals for environmental literacy for different grade levels. Contact your state department of education.

Setting age-appropriate goals

No two young people – and no two educators – are alike! And each person learns and develops in a unique way. These basic truths are apparent to anyone who works with youth. The following pages present some basic generalizations about youth development and energy/environmental education. While such generalizations can be helpful as we plan programs, there is no substitute for an educator knowing and caring about his or her particular learners, as individuals and as a group.

To help youth grow up to be thoughtful, active environmental stewards, we must present them with concepts and tasks that are challenging, but not overwhelming.

Energy concepts are important as a set of tools for understanding environmental issues and evaluating potential solutions. But it is generally not until their teens that young people have achieved the intellectual development to fully apply energy concepts in ecological contexts. Nevertheless, energy can still be a useful idea for younger children. It is not necessary to fully grasp energy concepts before applying them, since most common uses of the term do not conflict with scientific definitions.

As children grow up, their skills increase, their horizons expand, their social lives change, and their needs for challenge grow. Social and emotional development are often central goals of nonformal education programs. Energy and environmental education projects can offer opportunities to promote this development.

The following are some very general, suggestive guidelines for educating about energy for environmental stewardship. They are based on recent recommendations for science, environmental, and youth development education.[9] Activity samples are taken from resources listed on pages 29-37.

Kindergarten through Grade 2

Children at this age benefit when awareness is emphasized. Exploration with the senses that stresses careful observation can be a major theme.

Activities should cater to a variety of learning styles, include much physical activity, and offer lots of opportunity for success.

Energy education may be most successful when it focuses on familiarizing children with a variety of phenomena that result from moving water, wind, burning fuels, or electrical connections. The role of the sun in warming the earth, water, and air, the importance of the sun to plants, and the importance of plants as food for animals can be introduced.

From the activity "Energy All Around Me" in Living Lightly in the City, volume I:

Session I: Take your class on a sensory energy hunt around your school. Review the senses and begin in the school building. Do children feel energy being used (heating or cooling)? Do they smell energy (food cooking in the cafeteria)? Do they hear energy being used (typewriters, people moving, bells ringing)? How many different ways do they see energy being used?

From the activity "Temperature Hunt" in The Growing Classroom:

3. Organize the students into small groups, each supervised by an intern or aide.

4. Tell students that the object of the temperature hunt is to try to find the hottest and coldest spots in the immediate area. Remind them to be creative! The most extreme temperatures may not necessarily be in the most obvious places.

5. Ask each group to test the temperature at four places – two that they think will be hot and two that they think will be cold.

6. At each location, the adult supervisor will take the temperature reading. Students record location, temperature, and factors affecting temperature in their journals.

7. After all the readings are taken, gather the class together and compare findings.

What were the coldest and hottest readings taken? What was the difference in temperature between the coldest place and the hottest? How do you think the temperatures will change during the day?

Grades 3 through 5

Education for this group can begin to emphasize knowledge in addition to awareness. For example, learning about energy sources, and tracing these sources (including fossil fuels) back to the sun, are good activities. Investigations can involve more careful observations, measurements, and record-keeping.

Food webs are a valuable concept, but this age group has an easier time understanding energy in terms of physical systems than in terms of biological processes. Attention to things and processes that give off heat, and to the spread of heat from one place to another, is valuable for this age group.

These children can also begin to understand different values and points of view, and so can begin to explore community issues.

This age group's interest can be easily attracted, but their attention to any one thing may be short. They enjoy learning in groups, like to be with members of their own sex, and admire and imitate older boys and girls.

From the activity "Thermal Mass" in The Universal House:

Demonstrate the transference (conduction) of heat from one thermal mass to another. Fill a hot water bottle with water that is very warm (but not uncomfortable to touch). Lay it on the desk of a student volunteer. Have students test the normal temperature of their palms by placing them against their cheeks. Ask them to place their hands, palms down, on the hot water bottle for at least two minutes. Have them test the temperature of their palms against their cheeks again. What has happened? Why? Let other students repeat the activity, and guide students in a discussion of the transference (conduction) of heat – in this case from water to rubber to hand to cheek. Lift hot water bottle from desk to reveal heat conducted to desk. . . .

California Indians cooked food with hot stones. Clean cooking stones were heated in a fire and then, using a wooden utensil, placed in beautiful baskets filled with acorn mush. As stones cooled, they were removed and new stones added to further cook the mush. Where did the heat from the stones go? Why don't we cook this way today?

From the activity "Insulate or Not?" in Manipulative Energy Activities, Grades 4-6:

Objectives

The students will be able to:

- operationally define insulation
- list effective insulating materials
- graph and interpret data collected in the investigation. . . .

Procedures

With the four different types of insulating materials available, students will design a setup that will keep ice cubes from melting within a closed plastic bag. Students should use no more or less insulation than the cup will hold. For the "control" part of the experiment, place a plastic bag with a predesignated number of icecubes in a plastic cup without insulation. Measure the amount of water in each bag, including the control bag, after thirty minutes.

Grades 6 through 8

These youth will benefit when a major emphasis is placed on acquiring skills, including skills for investigating community issues and designing scientific experiments.

This age group is generally ready to understand that energy cannot be created or destroyed. They can focus on where energy comes from and where it goes in various transformations. Alternative energy systems (solar hot water, wind generators, insulation) are easy to understand, build, and test. Learning about atoms as universal building blocks has prepared them to begin to follow matter and energy through ecosystems.

This age group desires independence but still wants and needs adult help. They are ready for longer, in-depth learning experiences, and it is important to investigate questions that truly interest them.

Historical and literary examples of human problem-solving and technology provide the basis for reflection and thinking about the future. Offering career information related to topics of investigation helps to provide a realistic view of future choices.

Peer teaching and working with younger children can be effective learning tools. Social relationships are a good starting point for thinking about cause and effect, considering consequences of alternate solutions, and evaluating tradeoffs.

From the Junior Solar Sprint Teacher and Mentor Guide:

Working in Groups

The recommended size for groups in this project is 2 to 4 students. We advocate that this project be completed by students working in groups rather than students working individually for several reasons. First, individual cooperation, like competition, involves skill and practice and is important in the professional engineering workplace. Second, working in a group is very often a strongly positive part of the project for students who have less confidence with hands-on work if group members help one another. Third, having the students share amongst themselves the search for and use of materials makes this portion of the project less costly and less intimidating for everyone. . . .

Design Reviews as a Teaching Tool

A particularly successful classroom activity, called the "design review" in the professional workplace, requires students to explain their designs to the entire class. . . . The portion of the class listening to the presentation learns about other approaches to designing the car. The members of the group presenting have to understand their own project well enough to explain it. They receive useful feedback from their classmates, their teacher, and their mentor. Students gain valuable insight from constructively criticizing one another's work. It is important in the design review, to make sure that everyone gets a chance to give comments and receive suggestions.

From "Energize Your Local D.J." in the NEED Project Activities booklet:

Goals

- To have students learn the basics of media contact as well as gain an understanding of the workings of their local radio station
- To research and learn about at least one energy topic
- To broadcast energy information to the public

. . . It is best if the students approach the radio station about the activity. The station should be notified at least a month in advance; six weeks is preferable. At a minimum, most stations will agree to carry the public service announcements, and possibly use some of the stings and teasers. The chance that a station will use the students' material is increased if the activity is timed near NEED Week in March, Earth Day's anniversary, or other calendar events. Ideally, you would like the station to use your material over a whole week. For example, if the entire class is divided into five groups, the station could use one group's topic a day. Find out how flexible the station can be.

Grades 9 through 12

These young people benefit when they are allowed to put their knowledge and skills into practice as a major part of their learning. They want very much to be respected as young adults and will respond to opportunities to be resources for their community. Participating in community issues and teaching younger children are excellent opportunities for learning problem-solving skills, building confidence, and developing responsibility.

Use of case studies can give these youth meaningful classroom practice in analyzing the environmental, social, and economic aspects of energy issues, particularly if they can compare cases with their own community experiences.

These youth are ready to reflect on what the flow of energy in ecosystems means for human society. They can compare and evaluate the tradeoffs in alternate development paths and technologies, and propose policies for conserving energy resources. They are learning to balance skepticism with openness to new ideas, and are ready to look for the assumptions behind a line of reasoning.

From Chapter 3, "Getting it Together: Planning and Funding Your Project" in The Simple Act of Planting a Tree:

Planting Permits

As difficult as it sounds and as time-consuming as it can be, the permit process should ensure that appropriate trees are planted in the right place. It also makes possible uniform plantings so a design or species mix can be carried down a street or throughout a neighborhood. (The older communities in many of our towns reflect this, just as they reflect the days before air-conditioning when trees were used to keep homes cool.) Furthermore, during the permit process the agency should research and identify all planned developments, street widenings, and excavations that could have an impact on your plans in the coming years.

Below are some of the typical steps in the permit process based on our experience in Los Angeles where regulations can be complicated. Your city may not follow involved procedures, but these examples should prepare you for what's ahead. In every case, don't write a proposal or proceed with other preparations until you've made an initial phone call to gauge interest. Find the receptive ear first, then put all your enthusiasm into gaining permission.

From "Preparing for the World Conference" in Session 7 ofGlobal Warming and the Greenhouse Effect:

1. Students should still be in their conference preparation groups. Return each group's notes from the previous session, along with your comments and suggestions. Tell them to go over their notes from the previous session, adding ideas that may have occurred to them since then. Tell them also to refer to their Effects Wheels.

2. Explain that at the World Conference each group should be ready to:

a. **State their position** on dealing with global warming.

b. Ask questions or make statements about other groups' positions.

c. Suggest solutions that might be acceptable to most groups. (Summarize these tasks on the chalk board).

3. Remind the students that the main purpose of the Conference is not to find someone to blame for global warming, but rather to find out who and what is affected, and what can be done by acting together.

Energy learning opportunities for the 1990's

The most effective youth education – formal or nonformal – starts with the questions, interests, and concerns of young people, and empowers them to seek answers and solve problems. The subject matter must become meaningful through connections to the young person's everyday life in home and community.

While the "Energy Crisis" has faded from the headlines in the mid 1990's, environmental and economic issues have not. And every environmental and economic decision involves energy choices.

Energy offers helpful ecological perspectives for environmental problem-solving. Following the flow of energy

- offers an ecologically sound standard for measuring environmental impact. Decisions can include practical, empirical calculation of tradeoffs rather than becoming all-or-nothing arguments over values.
- focuses attention on the connections among environmental issues, allowing more creative thinking about potential solutions.
- helps keep a broader, longer term perspective on the sensational environmental issues that capture short-term media interest.

A recent national survey of over 10,000 youth in grades 4 through 12 found that 87% think it is important to "take part in activities that make the environment better." [10] This section describes several opportunities for youth environmental projects in the 1990's that have significant energy content, and suggests some helpful materials and resource organizations from those listed on pages 29-45.

Green consumerism and recycling

Young people are often eager to participate in the consumer economy, in part because of the decision-making power it involves. Young consumers can learn to investigate and evaluate everyday products based on their full life-cycle energy requirements, including manufacture, transport, use, and disposal. The most environmentally sound consumer decision in any particular case is seldom clear. Simple purchases can offer rich opportunities for discussing wants and needs and practicing informed decision-making.

Recycling projects are the flip side of green consumerism. With an energy emphasis, these projects can involve much more than simply collecting materials. Saving energy through reducing wasteful consumption, reusing items, buying recycled products, and influencing business and government policies are also part of the picture. Such projects can reinforce the idea of life-cycle energy costs. They can also show that effective environmental solutions often require action at several levels, from the individual consumer choice to government tax incentives and regulations.

See:
- *Living Lightly in the City*, volumes I and II
- *Living Lightly on the Planet*, volumes I and II
- *Project Learning Tree Environmental Education Activity Guide*

Urban and community forestry

Tree planting projects offer many benefits, from community beautification to neighborliness. The learning opportunities are endless, from community decision-making to landscape design and basic ecology. Participants can point to tangible, positive results. From an environmental perspective, the best reason to plant may be the energy savings trees can offer. Carefully planned landscaping around individual homes can provide cooling shade in summer and protection from freezing winds in winter. Urban communities with significant tree cover show measurable reductions in the heat-island effect. In addition, "ecological landscaping" can reduce the need for fossil fuel-intensive pesticides and fertilizers. Including these energy considerations can add to the practical and educational benefits of these projects.

See:
- *Growing Greener Cities*
- *The Simple Act of Planting A Tree*
- American Forests
- *Project Learning Tree Environmental Education Activity Guide*

(10) Louis Harris Polls, reported in the newsletter Grapevine, Center for Environmental Education, Pacific Palisades, California, Spring 1994

Food and Gardening

Food is our most important and immediate source of energy. Our global system for growing, processing, transporting, and distributing food is the most essential element of our participation in nature's economy. Growing and preparing food can also be great fun for all ages. Gardening, shopping, cooking, and eating offer opportunities for exploring, experimenting, learning about other cultures, and practicing life skills. Tracking the energy in our food system can be a valuable means to understanding the environmental consequences of our choices.

See: ▲ *The Growing Classroom*

▲ *Learning About Plants (LEAP)*

Wildlife ecology

Animals have always fascinated young children, and concern for biodiversity and endangered species has made wildlife an especially popular environmental education theme in the 1990's. Learning about how other creatures meet basic needs for food and warmth offers an opening for examining our own relationships to energy in food, clothing, shelter, and behavior. The insulation provided by winter coats is one parallel. How and where animals make their homes often have significant energy connections, and parallels can be drawn to human needs for shelter. Studying the energy content of food sources –and how much energy an animal must expend to obtain it– is one way to address food webs in depth. Behavioral adaptations to the seasons, such as the songbird's migration, also have obvious energy connections.

See: ▲ *Living Lightly in the City*, volume I

▲ *Learning About Plants (LEAP)*

Shelter

The cost of housing continues to be a major issue in the 1990's, particularly for low- and fixed-income Americans. Energy costs for heating and cooling in older or poorly constructed homes can be significant drains on a family's resources.

Ideally, homes constructed today will be useful a century from now. Housing planning, like tree planting, is an exercise in envisioning and preparing for the future. Buildings designed and oriented to make best use of the light and warmth of the sun, for example, are a gift to future generations.

Shelter projects can be as simple as having elementary students check for drafts or build models to test solar principles, or as involved as including teenagers in community weatherization efforts or home buidling projects. All ages enjoy the imaginative work of designing a home; the level of detail and requirements for ecological soundness in such designs simply depend on the knowledge and skills of the learners. Practical skills and concepts learned in such projects will be useful for future home owners and renters alike.

See: ▲ *The Universal House*

▲ Habitat for Humanity

▲ *Hot Water and Warm Homes from Sunlight*

Transportation

Our transportation system's heavy reliance on individual car ownership and fossil fuels is a critical issue facing American society. Addressing the issue can be difficult for youth, since most young people have very little control over their transportation choices until they can drive. Further, the policy decisions that will address the root of our transportation problems involve complex, long-term community development issues such as public transportation and zoning. Successes, even tangible results, are hard to see in the short term.

There are two good opportunities for young people to get involved in transportation. Bicycles are the first. Bicycle technology, including cost, safe use, maintenance, and repair, is easily within reach of older children and teenagers. Participating in community decisions to make streets safer for bicycles or build bike paths and bike locking facilities are manageably-sized pieces of the public transportation issue for young people to tackle.

Building models of energy efficient and alternatively powered vehicles offers a second opportunity for addressing transportation issues. Cars hold a fascination for many teens, and most young people will eventually become car owners. Familiarity with electric motors, photovoltaic technology, and energy efficiency in design will enable young people to be more knowledgeable, open-minded consumers when the time comes.

See: ▲ *Junior Solar Sprint*

▲ *Living Lightly in the City*, volume II

Energy/environmental audits

An "environmental audit" is a comprehensive examination and evaluation of the total environmental effects of an institution or action. The idea grew out of the success of "energy audits" in educating as well as finding ways to conserve electricity and fossil fuels. Environmental audits include water use, waste and recycling, toxics, food and consumer product choices in addition to energy for lighting, heating, and cooling, and transportation. Tracking energy in this broader environmental context and preparing realistic recommendations for action can offer a powerful environmental stewardship learning experience.

Audits require careful investigation and evaluation, but each age group can tailor the audit to its own level of sophistication.

An audit can be done as part of any program where young people voice concern about the environment. Club activities, 4-H projects, and scout camping trips can all be examined for their impact. Schools, summer camps, county fairs, and community centers, and other institutions involving youth offer opportunities for audits on a larger scale.

See:
- *Campus Ecology*
- *Energy Patrol* pamphlets
- *Atlanta Student Audit Program (ASAP) How-To Manual*
- National Energy Foundation (TEAMS Project)
- *Energy Projects for Young Scientists*

Sample goals for energy in environmental stewardship programs

The following sample goals are intended to help you energize your youth program. Taken together, they could form the basis for an energy/environmental stewardship education program, but they are not presented as a definitive list.

These goals follow the broad outline of the energy/environment topics list developed by the national review team (see page 13). They are intended to contribute to the development of environmental stewardship. They assume the use of experiential, youth development-oriented educational strategies. Goals in each category begin with those appropriate for younger children.

Energy Fundamentals

Youth will

- experiment with different ways of making things go, and understand that keeping anything going uses up some resource
- explore energy transformations in everyday life, including the generation of heat in the transformation process (entropy)
- trace the energy used in everyday life through the people and processes around the world that helped bring it to them, and to the ultimate source, the sun
- recognize producers, consumers, and transformers of energy
- measure and compare amounts of energy used
- identify renewable and nonrenewable sources of energy they use
- describe relationships between humans and their environment in terms of energy transformations
- understand energy in the environment and in human enterprises as part of a single, interdependent ecological system

Energy Use

Youth will

- identify uses of energy in their personal lives, including the energy used directly in heating/cooling, transportation, eating, and recreation, and indirectly in the manufacture, transportation, and disposal of everyday products
- give examples of effects of their own energy use on the environment
- trace the ways that energy is produced, distributed, and consumed in their community
- identify energy conservation measures in place in their community
- demonstrate practical understanding of everyday technology requiring different forms of energy, including the ability to choose technology appropriate to a task and to practice energy conservation
- explain how everyday tasks were accomplished with the technology available in the past, and how society's choices have led to the development of current technology
- explain how the energy system that characterizes their community or region is different from energy systems in other regions of the country and world
- recognize the unequal costs and benefits of the current energy system on different groups in society
- determine the role of energy in a community environmental issue

Energy Stewardship

In their personal lives, youth will

- demonstrate skills for auditing energy use and assessing environmental impact
- assess the intended and unintended consequences of different technologies on their lives and the environment
- evaluate their own lifestyle choices in terms of needs and wants
- experiment with and evaluate alternative energy technologies
- experiment with lifestyle changes, evaluating results and reactions
- practice energy conservation in household and eco-management

As members of their communities, youth will

- investigate public and private energy decision-making in their communities
- gather information on an energy issue, including library and telephone research, identifying local and national sources of information, interviews, and community surveys
- evaluate the effects of local energy use decisions on the quality of life and the quality of the environment in their community
- explore the potential consequences of different development paths for their community, including effects on other communities around the world
- identify several constructive ways to address a community energy issue, noting the tradeoffs that each potential solution might involve
- select and apply an appropriate problem-solving technique to a community energy/environment issue
- identify government agencies, businesses, and citizen groups at local, national, and international levels that would need to cooperate to implement a solution successfully
- investigate the educational requirements, working conditions, and compensation for jobs and careers in their community relating to energy and the environment
- identify local community service opportunities relating to energy and the environment

Using Local Resources

Successful environmental education programs make the best use of people, places, and organizations in their community. This not only helps connect young people with their natural and human communities, but strengthens community support for programs.

Finding local resources and building support should not be done by one person. The more people (especially youth!) you can involve in the process, the stronger the support and investment in the program will be.

With your knowledge of YOUR community, YOU can best find the local resources that will be most useful to you. The following organizations may be helpful:

Cooperative Extension/4-H

4-H is the youth development program of Cooperative Extension, the community outreach arm of each state's land grant university and the U.S. Department of Agriculture. Natural resource conservation has always been a 4-H theme, and many states offer energy and environmental education as part of their youth development programs. There are 4-H staff in many counties who can be valuable resources and collaborators. For a listing of state 4-H offices, see page 44.

State energy offices

Since the 1970's state energy offices, through their energy extension services, have offered information, advice, and education outreach programs to the public. Many have taken leadership in youth education. One way to find a contact in your state energy office is to call the U.S. Department of Energy's Energy Efficiency and Renewable Energy Clearinghouse (see page 41) at 800/363–3732.

Utilities

Many local gas, electric, and water utility companies offer educational programs and loan teaching materials at no or low cost. Kinds of programs vary, but these companies can often provide information about energy sources, conservation practices, and energy careers. Some of the materials listed in this guide are available through utilities. Call your local utility company to learn what it has to offer.

Museums and parks

Living history museums, and some interpretive programs in national and state parks, can offer a fascinating glimpse into past lifestyles, agricultural and industrial technology, and energy sources. For example, the American economy experienced energy booms and energy crises in fuelwood and whale oil before the era of petroleum! Some museums have been involved in energy education programs and may have materials available or have staff who can lead a tour with an energy theme. For information on sites in your area, call your state office of tourism.

Nature centers

Local nature centers often have staff who have planned energy education programs, and library resources dating from the 1970's. You may find an enthusiastic partner, with good ideas and experience to offer. And don't discount the energy education materials because their facts are old! Some energy education programs of twenty years ago did a good job of placing energy in its ecological context.

Published Resources

Materials for teaching, learning, and program planning*

Atlanta Student Audit Program (ASAP): How-To Manual

1993

cost: free materials are available to those in a position to plan programs

contact:
U.S. Department of Energy
Atlanta Support Office
730 Peachtree Street NE, Suite 876
Atlanta GA 30308
404/347-3482
or:
Kentucky Division of Energy
502/564-7192

This manual is designed to help state energy offices (or organizations with similar expertise and mission) to establish a program that guides high school students and teachers in saving energy in schools. It is not a program that a teacher or school could institute alone, although the audit section of the manual could be used in this way. There are two parts to the manual. The first part shows how to establish an ASAP program, including budgets, timelines, model documents, and training workshop agendas. As practiced in Kentucky, the program involves a one week training in June for a student-teacher team. The follow-through program for the next academic year includes meetings of participating schools to share ideas, and troubleshooting school visits by energy office staff. At the end of the year, a final report is presented to school administrators. The second part of the manual provides background, procedures, and checklists for the energy audit at the school. The project offers opportunities for learning specific technical skills and procedures in the context of a service project, but project scope is left up to each school to decide. While the manual focuses on technical information, some schools have included community surveys and energy education for elementary students as part of their plans. The manual offers little guidance in strategies for cooperative learning, critical thinking, and student leadership.

Special strengths: A well-developed program that can be modified to meet state needs. Opportunities for developing student leadership as well as strong technical skills.

Campus Ecology: A Guide to Assessing Environmental Quality and Creating Strategies for Change

1993

cost: $17.95

contact:
local bookstore or
Living Planet Press
PO Box 1679
Venice CA 90294
310/396-0188

This book presents a broad framework and guide for analyzing the nature and magnitude of environmental issues on college campuses. It is based on ideas developed by the Student Environmental Action Coalition around Earth Day 1990. A motivated high school environmental club could adapt the audit and action strategies to their institution. Relevant chapters include "Solid Waste," "Air Quality," "Water," "Energy," "Food," "Procurement Policies," "Transportation," "Campus Design and Growth," "Environmental Education and Literacy," and "Job Placement." Each chapter includes sections on assessment questions, research sources, recommendations, and resource publications and organizations. Includes a chapter on "Working for Environmental Justice." This is not a blueprint for an audit, but a workbook-style Campus Environmental Audit Response Form in the back of the book offers a good place to start. The book is written for college students, so it lacks guidance for teachers working with younger students in their approach to the school administration and school board.

Special strengths: Presents the idea of a comprehensive environmental audit, with tips on how to get started and what to do with the results.

*Listed costs are subject to change and do not include shipping and handling charges.

Connections: A Curriculum in Appropriate Technology

1980

cost: $5.00

contact:
National Center for Appropriate Technology
PO Box 3838
Butte MT 59701
406/494-4572

This series of 10 lessons introduces the concept of alternative technology in terms of youths' everyday experiences. Topics include water and energy conservation, transportation, waste and recycling, using solar energy, and the food system. The book's illustrations are particularly attractive. Lessons often introduce concepts by lecture rather than through questions and experiences. Hands-on projects are demonstrations rather than explorations.

Special strengths: Despite its 1980 publication date and its lack of experience-based methods, *Connections* offers an introduction to the concept of appropriate technology that is very relevant to today's concerns for sustainable development. Creative educators can help youth apply these ideas to projects in the community.

Conserve and Renew

1990

cost: $12.00
may be photocopied for educational purposes

contact:
Earth Lab
Sonoma State University
1801 East Cotati Avenue
Rohnert Park CA 94928
707/664-2577

Conservation is the overall theme for this set of activities. Topics range from basic energy concepts to energy policy and conservation ethics in sections titled "What is Energy?" "Renewable or Nonrenewable," "Net Energy," "Energy Conservation," "Recycling," and "Ethics." They could be used with older students than the intended grades 4 to 6. These are fun activities useful for nonformal as well as formal settings, but they are not designed for long-term projects and youth leadership. Questionspromote critical thinking.

Special strengths: Provides an excellent coverage of energy/environment topics, particular basic energy concepts. Promotes cooperative learning and critical thinking skills.

Cooking with the Sun: How to Build and Use Solar Cookers

1992

cost: $7.95

contact:
local bookstore or
Morning Sun Press
PO Box 413
Lafayette CA 94549
510/932-1383

Aimed at a general audience, this resource can be useful to educators, and older youth working with children, who are interested in a fun project with lasting benefits. Solar cooking technology has been proposed to help reduce use of scarce fuelwood in the developing world. Includes detailed instructions for building a solar oven, hot plate, and "minimum solar box cooker" which can be built in two to four hours for almost nothing. Cooking instructions and dozens of recipes–from breads to casseroles to meats and vegetables–are included. Creative educators could develop this project into a lesson in problems and potential of appropriate technology and sustainable development.

Special strengths: All the information needed to put a simple, solar technology into practice.

Energy Patrol pamphlets

Turn Out Those Lights!
Here Comes the Energy Patrol: A Step-by-Step Guide

Marketing Energy Patrol: Tips from Arizona Energy Pros

undated

free

contact:
Arizona Department of Commerce Energy Office
3800 North Central Avenue
Phoenix AZ 85012
602/280-1300

Many good teaching materials have been developed to involve young elementary students in school energy conservation projects. These two very brief and to-the-point pamphlets offer teachers, school administrators, and state agency staff the basic tools needed. Topics include generating interest, introducing the program, getting school board approval, keeping motivation high, and tracking results. Pamphlets include case studies and sample checklists and certificates. The program encourages schools to measure and publicize actual savings on energy bills. Pamphlets do not include suggestions for energy and environmental education to give meaning to the program beyond dollars saved.

Special strengths: Ideas to promote youth leadership in energy conservation at the elementary level.

Energy Projects for Young Scientists

1987

cost: $10.00

contact:
National Energy Foundation
5160 Wiley Post Way, Suite 200
Salt Lake City UT 84116
801/539-1406

This book leads the reader through 60 potential science projects grouped in seven chapters. Topics include "Heat and Thermal Energy," "Electrical Energy," "Solar Energy," and "Saving Energy at Home and School". Intended audience is middle and high school youth, but could be used by an adult leader. Experiments can be used to provide youth in nonformal education projects with a conceptual understanding of energy.

Special strengths: Teaches practical measurement of energy, including calories, conductivity and R values, heating degree days. The culminating activity "Be a House Doctor" includes an energy audit.

Energy Skill Builders

publication dates from 1985–1993

cost: check availability from local utility

contact:
local utility or
Enterprise for Education
1316 Third Street, #103
Santa Monica CA 90401
310/390-9864

This collection of over twenty 8–16 page booklets offers strong science, technology, and society background information for youth. Intended audience for most booklets is grades 6 through 12, but some are for younger children. Booklets offer a combination of text that includes questions to promote critical thinking and information-rich visual images including striking diagrams and graphs. Several include instructions for hands-on experiments and explorations. Best booklets for activities include a series focusing on electricity: *Energy Transformations, Generating Electricity, Sources of Electricity, Demand for Electricity, Efficiency of Electric Appliances, Is Efficiency Our Best Energy Source?, Climate and Comfort, Electricity from Water, Wind, and Sunlight,* and *Measuring Helps an Electrician*. Best booklets for information content include *Geology of Oil, Refining Oil, Natural Gas, Greenhouse Effect and Global Warming*, and *Hazardous Waste from Homes*. Other energy sources addressed include nuclear and coal. Secondary teachers who like the approach may want to investigate this publisher's 900-page *Energy 90's* secondary curriculum.

Special strengths: A strong source of background information on energy, presented in a highly readable form. Educators and older youth may want to use these booklets in preparing for teaching.

Energy Sources and Natural Fuels

1993

cost: student booklet $12.95 each
teachers guide (draft) $4.00

contact:
National Science Teachers Association
Publication Sales
1840 Wilson Boulevard
Arlington VA 22201-3000
800/722-NSTA

This resource offers ways to present several basic energy and biological concepts in depth through hands-on laboratory experiences. For example, students repeat the procedures and thinking of early scientists in the discoveries of oxygen, carbon dioxide, and photosynthesis. The activities present the relationship between energy, photosynthesis, and fossil fuels by having students observe the anaerobic decay of plant and animal matter that produces kerogen—the first stage of the creation of fossil fuels—and measure its energy. Many educators will have difficulty using these materials. The books are expensive if bought for each youth, and the lab procedures are time-consuming. A normally-equipped school laboratory and knowledge of safe laboratory technique are required. There is little background information and explanation for educators. No implications are drawn for energy issues facing society. Creative program planners can take the experiments in this book and include them in energy education programs to make photosynthesis and fossil fuels more meaningful to learners.

Special strengths: Offers a way to help youth understand photosynthesis and its relationship to energy and fossil fuels through direct experimentation.

Global Warming and the Greenhouse Effect

1990

cost: $15.00

contact:
Great Explorations in Math and Science (GEMS)
Lawrence Hall of Science
University of California
Berkeley CA 94720
415/642-7771

An introduction to the scientific basis and societal implications of global warming. Designed for ten standard class periods but can easily be expanded into a larger, long-term inquiry with suggested "Going Further" activities. Activities include brainstorming, a simulation game, and role-playing in a World Conference on Global Warming, as well as practice in scientific method and techniques. Stresses cooperative learning and critical thinking activities. Highly detailed instructions for educators include time frames, daily materials lists, suggestions for classroom arrange-

ments, and questions. Suggested schedule includes little time for reflection and does not suggest assessment strategies to match its creative approaches to learning. This unit could be a powerful learning experience that might be difficult to confine to the time period suggested.

Special strengths: Provides detailed step-by-step instructions for educators not familiar with the role of learning facilitator.

The Growing Classroom: Garden-Based Science

1990

cost: $27.00

contact:
Let's Get Growing
1900 Commercial Way
Santa Cruz CA 95065
408/464-1868
408/476-1427 fax

Energy is an integral part, but not a major emphasis, of this award-winning program. The focus of this 480-page resource for elementary science and nutrition education is ecological understanding using gardens as hands-on "living laboratories." The program emphasizes cooperative learning strategies, and activities are rich in experimentation, investigation, data collection, analysis, discussion, and fun. Strong connection between energy and food through activities on food webs and nutrition. Energy in the economy is addressed through comparisons of processed and unprocessed foods. Programs aiming to emphasize energy in gardens should supplement this resource with others that focus on energy. Let's Get Growing also offers a catalog of related curriculum products, including calendars, grade-by-grade teacher resource books for a comprehensive earth, physical, and life science curriculum, a videodisc database, student lab books, and music tapes.

Special strengths: Ideas for how to create a hands-on environmental learning experience through an ongoing gardening project. Fun activities and practical advice for organizing and sustaining a project as part of a school or community program curriculum.

Growing Greener Cities: A Tree-Planting Handbook

1992

cost: $7.95

contact:
local bookstore or
Living Planet Press
558 Rose Avenue
Venice CA 90291
310/396-0188

This book, prepared by American Forests (see page 41) introduces the concept of the "urban forest" and the positive role of trees in the city environment. Trees' potential for energy conservation is one of the major areas addressed. Part II: Planting Your Tree offers practical step-by-step advice for planning, planting, and maintaining in the urban forest. Part III: Global ReLeaf, the Community, and the World includes Eight Steps to Organizing a Community and a brief section on Educating the Children. Includes a listing of printed resources and resource organizations.

Special strengths: Ecological approach to urban trees. Part II: Planting Your Tree is a very useful guide to considerations in planting urban trees.

Hot Water and Warm Homes from Sunlight

1986

cost: $10.00

contact:
Great Explorations in Math and Science (GEMS)
Lawrence Hall of Science
University of California
Berkeley CA 94720
415/642-7771

A five-session introduction to controlled scientific experimentation. Youth in grades 4 through 8 first build small model houses out of paper to find out how covered and uncovered windows affect passive solar heating of the house. Then they investigate the effect of clear covers on solar water heating efficiency. Clear step-by-step instructions for educators include time management suggestions. Scientific procedures and measurements are the focus, but there is little emphasis on developing questions or linking the experiments to community energy issues. Could be used at the beginning of a project to investigate energy efficiency in homes.

Special strengths: The activities offer practice in designing and evaluating data from controlled experiments.

Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules—Teacher's Edition

1992

cost: $18.80 teacher's edition
$9.80 student edition

contact:
Stipes Publishing Company
10-12 Chester Street
Champaign IL 61820
217/356-8391
217/356-5753 fax

The purpose of this workbook is to help young people become autonomous investigators of environmental issues and to teach them the basics of citizenship action strategies. It is written by Harold Hungerford and others, based on their work in developing environmental literacy. Modules include "Environmental

Problem Solving," "Getting Started on Issue Investigation," "Using Surveys, Questionnaires, and Opinionnaires," "Interpreting Data From Investigations," and "Environmental Action Strategies." The approach to issues is abstract, and the fill-in-the-blank format of the workbook de-emphasizes discussion and group learning. Sections on analyzing issues, developing and interpreting surveys, and thinking through the effects of action strategies will be helpful to educators. Good discussion of factors determining environmentally sound behaviors.

Special strengths: Final module on Environmental Action Strategies will be especially useful for helping youth think through the effects, and effectiveness, of possible actions.

Junior Solar Sprint

1994 (contest updated annually)

cost: free print materials
$5.00 for regulation solar panel

contact:
Junior Solar Sprint
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden CO 80401
800/639-3649
303/231-1006 fax
solsprnt@nrel.gov

Middle school youth build and race solar-powered model electric cars in this program. Youth learn basic concepts of electric power, mechanical engineering, and project development. In the process they also learn teamwork and cooperative problem-solving. Interactions with community mentors offer an introduction to science careers. Materials include a *Teacher and Mentor Guide*, *Building a Model Solar Car: Student Guide for the Junior Solar Sprint Competition*, a video introducing the competition, and interactive computer software that leads participants through design considerations. Contestants must buy solar panel to power the car from race organizers, and other materials must comply with contest rules. Project can take eight weeks to a year. Project materials do not touch on social/environmental implications of solar/electric vehicles, but this dimension could be added by creative educators.

Special strengths: An experience-based youth development project.

The Kid's Guide to Social Action: How to solve the social problems you choose— and turn creative thinking into positive action

1991

cost: $14.95

contact:
local bookstore or
Free Spirit Publishing, Inc.
400 First Avenue North, Suite 616
Minneapolis MN 55401
612/338-2068

This handbook introduces in depth many skills for citizen participation. The book is written for young people, but will be most useful in the hands of formal or nonformal educators and youth working together. The book is attractively laid out and presents many concrete examples of checklists, survey forms, letters, news releases, petitions, proclamations. Includes inspiring stories of youth action, with many focused on environmental issues. Provides step-by-step guides to developing such "power skills" as telephoning, letter-writing, speechmaking, surveying, fundraising, and getting media coverage.

Special strengths: Practical skills for citizen action and community involvement, with the focus clearly on helping youth address problems of their choice.

LEAP (Learning About Plants)

1991

cost: $15.00 for each grade level, 1-6

contact:
Children's Programs
Arnold Arboretum
125 Arborway
Jamaica Plain MA 02130
617/524-1718

Energy is a major focus of this elementary life science curriculum. Each grade K through 6 is presented in a separate binder with four units and approximately twenty activities. Children learn about the characteristics and needs of living things, and the important food-producing role that green plants play in living communities. Includes in-depth introduction to food energy in photosynthesis and respiration. Activities for grades 3, 5, and 6 are addressed most specifically to energy. The curriculum emphasizes understanding what children already know (or think they know) through introductory activities, then helping them develop more accurate and complete science concepts through focus activities, and demonstrating new knowledge through summary activities. LEAP materials' careful development of energy concepts offers a good review of these ideas for educators. Materials emphasize critical thinking but not youth initiative or life skills. Most activities are teacher-centered and few hands–on outdoor activities with plants are included. However, these materials could be an excellent companion resource for a youth gardening project.

Special strengths: Presentation of energy in the ecosystem for elementary school students.

Let's Get Energized

1988

cost: free
may be photocopied for educational purposes

contact:
California Energy Extension Service
1400 Tenth Street
Sacramento CA 95814
916/323-4388

This is a collection of 37 energy awareness activities designed for nonformal K-6 after-school programs. Activities are adapted from a range of sources, many of which are listed in this guide. Contents are organized by type of activity rather than subject matter: quiet activities, large group activities, small group activities, crafts, drama, creative writing, and music activities, movement activities, and challenge labs. An appendix provides some background on energy for the educator.

Special strengths: Pulls together a set of fun nonformal learning activities from a variety of sources.

Living Lightly in the City

volume I—grades K-3
volume II—grades 4-6
1982 (volume II revised 1992)

cost: $19.00 for each volume

contact:
Schlitz Audubon Center
1111 East Brown Deer Road
Milwaukee WI 53217
414/352-2880

Each volume includes over 40 activities that build understanding and awareness of the youth's environment. Can be used as the basis for a community youth program or integrated into the school curriculum. Encourages youth to explore the natural and technological systems at work in their communities. Energy is a key concept in "living lightly" – having minimal impact – on these systems. While its stated purpose is to have youth "adopt" an environmental ethic, the technique is to have youth question, experience, think critically, and develop their own values. These activities set the stage for potential long-term projects for older youth. Each unit is accompanied by a list of additional resources.

Special strengths: Presents energy as an important part of a holistic approach to environmental education. Encourages development of environmental stewardship in age-appropriate ways. Especially appropriate for diverse, urban youth.

Living Lightly on the Planet

volume I—grades 7-9
volume II—grades 10-12
1985

cost: $19.00 for each volume

contact:
Schlitz Audubon Center
1111 East Brown Deer Road
Milwaukee WI 53217
414/352-2880

These volumes continue the "living lightly" theme, broadening the focus to global environmental issues and their impact on our lives. Volumes each contain about 30 activities. Units in both volumes address population/resources and water. Energy is addressed in volume I in activities on natural cycles, recycling, and the "urban ecosystem." Energy is addressed in volume II in units on appropriate technology, biology as a model for design of urban systems, and an inquiry into viewpoints on nuclear power. Many activities could be used as starting places for community-based projects, but the emphasis of the materials is on research and discussion in the classroom.

Special strengths: Critical thinking activities for older youth, including understanding different perspectives on environmental issues. Youth are challenged to think about environmental issues in terms of systems and to look to natural systems for potential solutions to environmental problems.

Manipulative Energy Activities

1987

cost: free

contact:
Information Services Manager
Energy Division
Louisiana Department of Natural Resources
PO Box 44156
Baton Rouge LA 70804-4156
504/342-1399

This resource is in the form of two booklets – one for grades 4-6 and one for grades 7-8.

These activities focus on simple experiments using inexpensive, everyday materials and tools. Youth learn through a process of exploration and invention, leading to further questions and conceptual understanding. All activities are intended to teach basic science and social studies principles of energy conservation. Some activities (notably the grade 7-8 activities on electric motors) are arranged in sequence to encourage exploration of concepts in depth. Each booklet includes over twenty activities, with some activities – adjusted for age – common to both. Reproducible pages to create the board game Cartel – modeled after Monopoly – are included in both booklets.

Special strengths: Inexpensive, hands-on science investigations that introduce energy concepts in everyday life.

National Energy Education Development (NEED) Project

continuous updates

cost: 1994 membership is $25.00 per school/organization

contact:
NEED Project
PO Box 2518
Reston VA 22090
703/860-5029

NEED is a national network of students, educators, and community, industry, and government representatives. NEED's primary purpose is to empower young people. Youth participants are expected to take a leadership role in teaching themselves and others about energy. The program emphasizes fun activities youth can lead, including games and scripts modelled after television shows: *Energy Jeopardy, A Current Energy Affair*, and *Classic Energy TV. The Energy Conservation Contract* has youth work with their families and neighborhoods to make a conscious effort to save energy over the course of a month. Results are tallied and publicized. Other projects for which NEED offers detailed ideas include establishing an energy resource center, adopting a younger class, and preparing an energy time capsule. Schools and other educational groups can become NEED members by fulfilling several basic requirements, including sending a team to a leadership workshop. The program offers an array of materials, including a *Local Participation Kit, Energy Exchange* magazine, energy fact sheets, and T-shirts, buttons, balloons, and other merchandise.

Special strengths: NEED's simple and fun approaches make it easy for youth to take a leadership role, and (perhaps more importantly) for traditional teachers to step into a new role with their students.

NoodleHead Network videos

How to Make Your Own Great Videos with Just a Camcorder

1993

cost: $125.00*

contact:
NoodleHead Network
107 Intervale Avenue
Burlington VT 05401
802/860-6521

This 25-minute video shows teenagers working together to make a videotape without special editing equipment. Offers clear, step-by-step instructions, with ideas presented by the teens themselves. Comes with brief *Student/Teacher Companion Guide* that reinforces the ideas presented. Technical ability beyond operating a camcorder is not necessary. Emphasis is on creating fun videos that express youth points of view.

Special strengths: One or two viewings can inspire (and prepare) any youth group in middle school and above to plan and make a video with a message.

Simple Things You Can Do to Save Energy: The Power is In Your Hands

1993

cost: $75.00*
contact: NoodleHead Network
107 Intervale Avenue
Burlington VT 05401
802/860-6521

This fun 15-minute video teaches lessons about home energy use and conservation including weatherization and appliance efficiency. More important, it demonstrates the power of videos made by young people. While education, utility, and video experts provided guidance, youth were clearly the creative force behind the production. From script development, to acting, to editing, the video is filled with teenage imagination and wit. This video has won first place awards in international and U.S. Department of Energy competitions.

Special strengths: Especially when paired with "How to Make Your Own Great Videos with Just a Camcorder" this video can launch a class or youth group into creative energy education for their community.

* Mention 4-H to receive these discounted prices. Videos can be purchased together for a total cost of $175.00.

Poster Power poster series

various publication dates

cost: $3.00 each (*Science of Flames* poster $5.00)
may be available from local utility

contact:
National Energy Foundation
5160 Wiley Post Way, Suite 200
Salt Lake City UT 84116
801/539-1406

This collection of posters presents energy information in colorful form. Posters on *Oil, Coal, Renewable Energy Sources, Electrical Generation, Natural Gas,* and *Nuclear Energy* include information on energy sources, production, and use. Each of these six energy source posters is busy with images and text that require close-up study. Most of the information is in the text. Poster on *Ways to Save Energy In and Around the Home* allows children to peek into a house to observe conservation practices, and is accompanied by suggestions for use. *Science of Flames* poster is particularly dramatic, and includes explanations and activity ideas on the reverse.

Special strengths: These posters will brighten any room, and may lead to youth questions about energy.

BEST COPY AVAILABLE

Project Learning Tree Environmental Education Activity Guide

1993

cost: varies, available through frequent, local workshops

for state contact, call or write:
American Forest Foundation
1111 19th Street, NW
Washington DC 20036
202/463-2462

This environmental education activity guide can serve as a primary resource for planning a general environmental stewardship program. Energy is not a primary focus, but the 402-page guide for K-8 includes activities that address a variety of key energy education opportunities including renewable and nonrenewable resources, green consumerism and recycling, food webs, and habitat. At this writing PLT is developing new high school materials as well. PLT guides are distributed only through workshops, where educators get a chance to try activities, share ideas, and plan.

Special strengths: Project Learning Tree underwent extensive revisions in 1990-93 to improve its use of experience-based methods and to provide more background and support for educators. Offers full range of activities for developing environmental stewardship. Activities are adaptable to formal and nonformal settings.

Science Activities in Energy

1991

cost: free
materials may be photocopied for educational purposes

contact:
U.S. Department of Energy
Office of Scientific and Technical Information
PO Box 62
Oak Ridge TN 37831
615/576-1301
615/576-2865 fax

A collection of over 100 simple, easily prepared energy experiments that illustrate principles and problems related to various forms of energy. Investigations are designed for youth in third grade and above, and require a minimum of adult guidance. The series is composed of units addressing *Biomass*, *Chemical Energy*, *Conservation*, *Energy Storage*, *Electrical Energy*, *Solar Energy*, and *Wind Energy*. Each unit is composed of about a dozen activities, and each activity begins with an intriguing question or challenge. Answers and explanations are, for the most part, not provided, leaving youth and adults to explore and assess results together. Background information is sparse and implications of experiments for energy issues in society are not always clear.

Special strengths: Materials are designed to enable youth to take the initiative in scientific investigation. Taken together, the activities in each unit encourage in-depth exploration of energy questions.

Science Projects in Renewable Energy and Energy Efficiency

1991

cost: $10.00

contact:
National Energy Foundation
5160 Wiley Post Way, Suite 200
Salt Lake City UT 84116
801/539-1406

This handy reference tool was prepared by the U.S. Department of Energy's National Renewable Energy Laboratory and the American Solar Energy Society. It is designed for teachers and others working with young people on science projects. Includes 10 pages of tips for teachers and students on planning, carrying out, and reporting on science projects; 80 pages of suggestions for science projects under eighteen topics including "Solar Buildings," "Photovoltaics and Photoelectrochemistry," "Biofuel Production," "Energy Storage," and "Energy Efficiency"; and 45 pages listing hundreds of resource books and articles, equipment suppliers, and resource organizations and agencies. The book assumes familiarity with lab equipment and experimental design. Nonformal leaders and teachers without a background in science education may have difficulty putting some project ideas into practice.

Special strengths: Tips on planning science projects for youth and teachers. Comprehensive resource listings.

The Simple Act of Planting a Tree

1990

cost: $12.95

contact:
local bookstore or
Jeremy P. Tarcher, Inc.
5858 Wilshire Boulevard, Suite 200
Los Angeles CA 90036

This is a detailed guide to the skills required for mobilizing communities around urban forestry projects. The book presents many of these skills through stories about the work of the Los Angeles citizen group TreePeople and its founder, who started the organization at age 15. Topics include "Canvasing the Neighborhood," "Public Speaking," "Enhanced Volunteer Coordination," "Funding: The Other Green Stuff," "Event Logistics," and "Caring for Urban Trees." Appendices include a "Planting Project Workbook and Tree Care Project Workbook," with over 40 pages of helpful checklists. Layout including photographs, diagrams, boxed information, and headings make the book easy and fun to read.

Special strengths: Inspiring stories and step-by-step advice for organizing community environmental improvements.

Sunship Earth

1979

cost: $14.95

contact:
American Camping Association
5000 State Road 67 North
Martinsville IN 46151
800/428-2267

This book by well-known environmental educator Steve Van Matre presents in detail the guiding philosophy and day-by-day activities for a week-long environmental education immersion experience for grades 5 and 6 (and their teachers) in a camp setting. This intensive experience is preceded and followed by related activities back in the classroom. Emphasis is on conceptual understanding (the big picture) and sharpening sensory awareness. "Energy Flow," including photosynthesis, food chains, and energy loss, is one of seven interdependent ecological concepts emphasized. The Earth is presented as a spaceship powered by the sun. The role of "magic," including imagination, ceremony, fun, and sense of wonder are emphasized in educational strategies. The writing is simple, clear, and inspiring. Activity descriptions include imaginative ways of capturing youths' attention and introducing ideas. The focus of the week is to develop a relationship with the natural world; the program does not emphasize environmental action skills. The program is a highly planned experience, with guiding philosophy and goals clearly presented. Educators are urged to consider their own goals and methods with the same care.

Special strengths: Imaginative presentation of energy as a key to ecological understanding. Specific ideas for planning camp programs.

The Universal House: Energy, Shelter, and the California Indian

1992

cost: free
may be photocopied for educational purposes

contact:
California Energy Extension Service
1400 Tenth Street
Sacramento CA 95814
916/323-4388

This brief but in-depth set of activities for grades 4 and 5 introduces basic energy concepts in the context of shelter design. Focus on Native American homes adds a cultural dimension. Emphasizes cooperative learning, thematic approaches, and hands-on activities. Accompanied by four classroom posters on *Insulation, Thermal Mass, Shade,* and *Orientation.*

Special strengths: Designed for school use, but could easily be adapted to camp settings where older youth may be inspired to try building their own model dwellings based on Native American design.

Bibliographies and online information sources

Energy Education Resources: Kindergarten through 12th Grade

1994

free

contact:
National Energy Information Center, EI–231
Energy Information Administration
U.S. Department of Energy
Room 1F–048, Forrestal Building
1000 Independence Avenue SW
Washington DC 20585
202/586-8800
202/586-1181 (TDD)

This annually-updated publication lists organizations that offer free or low-cost energy-related education materials. Listed organizations vary from industry associations to environmental advocacy groups to government agencies. Over 100 entries included for 1994, with addresses, phone numbers, organization description, and description of materials and services. Materials are not screened for educational value.

Environmental Education: Compendium for Energy Resources

1992 with ongoing updates

free

contact:
California Energy Extension Service
1400 Tenth Street
Sacramento CA 95814
916/323-4388

This 40-page publication represents an ongoing effort to evaluate available energy education materials. The project is jointly sponsored by the California Department of Education, California Energy Extension Service, and Sonoma State University. Over thirty K-12 teachers read and answered a series of questions about 45 different resources. The resulting publication issues a detailed "report card" for each, and includes sample pages to give a taste of the materials.

ERIC Clearinghouse for Science, Mathematics, and Environmental Education

continuous updates

free and low-cost

contact:
ERIC/CSMEE
Ohio State University
1929 Kenny Road
Columbus OH 43210-1080
800/276-0462
614/292-0263 fax
ericse@osu.edu

Under contract to the U.S. Department of Education, the Educational Resources Information Center (ERIC) maintains the world's largest education-related database. The primary function of the Clearinghouse for Science, Mathematics, and Environmental Education (CSMEE) is to collect, index, abstract, retrieve, and disseminate printed materials in education. Two monthly publications, *Resources in Education* and *Current Index to Journals in Education*, provide a summary of current resources. The variety of products available from the Clearinghouse is listed in CSMEE's current publication list. It is available at no cost from the Clearinghouse, and may be browsed at ericse@osu.edu.

Eisenhower National Clearinghouse (ENC) for Mathematics and Science Education

continuous updates

free and low-cost

contact:
ENC
Ohio State University
1929 Kenny Road
Columbus OH 43210-1079
614/292-7784
info@enc.org

A new service for mathematics and science education, funded by the U.S. Department of Education as part of the Education 2000 goals set by the President and the Nation's Governors in 1989, ENC is scheduled to begin opening in 1994. The purpose of the clearinghouse is to encourage the adoption and use of K-12 curriculum materials and programs that will improve teaching and learning in math and science. The ENC will eventually offer a free, comprehensive, multimedia collection of curriculum materials and programs, teacher evaluations of products and services, online discussions, and traditional catalog access. Parents and students, as well as teachers, will be encouraged to make use of the service.

EE–Link

continuous updates

free electronic access

contact:
EE–Link
National Consortium for Environmental Education and Training (NCEET)
School of Natural Resources and Environment
University of Michigan
Dana Building 430 East University
Ann Arbor MI 48109-1115
eelink@nceet.snre.umich.edu

A new on-line resource for information on environmental education, funded in 1992 by the Environmental Protection Agency. This Internet "gopher" provides access to teaching resources, including instructional materials, articles, databases, and grant information in three ways. First, it is a filter that guides users through the Internet to files, directories, and databases useful to environmental educators. Second, EE–Link provides connections to other gophers for access to more general education and environment resources. Third, it offers environmental education materials NCEET has collected from print sources or electronic files not readily available on the Internet. These include conference listings for environmental educators and literature from the ERIC database. EE–Link is accessible to anyone with a computer and a modem. There is no cost once you have connected.

Global Change: A Resource Guide for Educators

1993

free

contact:
USDA Forest Service
201 14th Street SW
Washington DC 20250
202/205-1043

This pamphlet (FS 557) lists government agencies, citizen organizations (including organizations that involve youth), newsletters, curricula, books, articles, and videos on the subject of global climate change. Most resources are appropriate for middle and high school levels.

The New England Energy Education Guide

1993

free

contact:
U.S. Department of Energy
One Congress Street, Suite 1101
Boston MA 02114
617/565-9705

A guide to energy and environmental education resources in New England. Some resources described are available nationally. Includes descriptions of energy education programs offered by individual utility companies, and programs offered by state agencies and environmental organizations. Sixty listings, indexed by grade, state, topic, and organization name.

Resource Organizations

American Forests

1516 P Street NW
Washington DC 20005
202/667-3300
202/667-7751 fax

Sponsors Global ReLeaf, an international program that brings together business, citizen groups, and government agencies for tree planting and care. Energy and sustainable development issues are consistent themes. Publishes Urban Forests magazine, which includes news and how-to information about community tree projects. Resources for educators include *Growing Greener Cities: an Environmental Education Guide* and *World Forests: Striking a Balance Between Conservation and Development*.

Bullfrog Films, Inc.

PO Box 149
Oley PA 19547
800/543-FROG
610/370-1978 fax
bullfrog@igc.apc.org

Educational films and videos focusing on the environment. Topics include energy, sustainable development, science and technology, and citizen action. Short subjects to several-hour series, accompanied by teacher guides.

Edison Electric Institute

Educational Services
701 Pennsylvania Avenue NW
Washington DC 20004-2696
202/508-5591

An organization of electric utility companies. Mission includes assisting member companies in community outreach and education. Sponsors ElectroMotive, a high school electric vehicle challenge, with U.S. Department of Energy.

Energy & Environmental Alliance

Institute of Science and Public Affairs
361 Bellamy Building
Florida State University
Tallahassee FL 32306-4016
904/644-0707
dlahart@garnet.acns.fsu.edu

Part of the public outreach arm of Florida State University, the Alliance links individuals, schools, colleges, and environmental education organizations with government and business. Publishes *4 Es Connections* (energy, environment, economics, and education), a newspaper-style periodical for educators, including program news, practical tips, information on new materials, and special inserts with teaching ideas and background on topics integrating the four Es. Publications have Florida emphasis but national usefulness.

Energy Educators of Ontario

517 College Street, Suite 406
Toronto, Ontario M6G 4A2
CANADA
416/323-9216
416/323-0689 fax

This active organization produces and continually updates interdisciplinary energy education materials, including hands-on activities, worksheets, simulation games, and readings for K-12 classrooms. Several early elementary materials are available in French. Emphasis is on the Ontario curriculum and Canadian energy concerns, but most activities are transferable to U.S. classrooms. Membership includes a newsletter that brings information on Canadian energy educations and concerns. Cost of materials is comparable to commercial products in the U.S.

Energy Efficiency and Renewable Energy Clearinghouse (EREC)

PO Box 3048
Merrifield VA 22116
800/363-3732 (800/DOE–EREC)
energyinfo@delphi.com

Provides U.S. Department of Energy information on energy efficiency and renewable energy technologies. Offers educational resources including brochures and fact sheets, a free video, *Tomorrow's Energy Today*, and the booklet *Energy Education Resources: Kindergarten through 12th Grade* (see page 38). Also answers technical inquiries.

Habitat for Humanity

121 Habitat Street
Americus, GA 31709-3498
for a local contact, call 800/HABITAT

Habitat is an international voluntary service organization that builds low-income housing. There are opportunities for high school age youth, working with an adult, to get involved in hands-on projects in many communities. Some local Habitat groups, helped by Habitat's national Department of Environment, include energy and environmental considerations in home design and construction.

League of Women Voters

1730 M Street NW, 10th Floor
Washington DC 20036
202/429-1965

A nonpartisan organization promoting citizen education and action. Concerns relating to energy and the environment include waste reduction and recycling, nuclear waste, and global climate change. Local chapters may have school outreach programs, and may be a helpful resource in addressing controversial local environmental issues in a fair and balanced way.

National Consortium for Environmental Education and Training (NCEET)

School of Natural Resources and Environment
University of Michigan
Dana Building 430 East University
Ann Arbor MI 48109-1115
313/998-6726
313/936-2195 fax

Works to support K-12 environmental education, with funding from U.S. Environmental Protection Agency. Publishes the *Environmental Education Toolbox*, designed for program developers, inservice training planners, and teachers. The *Toolbox* currently includes a *Workshop Resource Manual* to provide background and tools for improving inservice education; *Getting Started: A Guide to Bringing Environmental Education Into Your Classroom*, a manual for teachers; a Slide Resource Kit, including a prepared slide show that can be customized; and a *National Survey of EE Teacher Inservice Education*, which includes state contacts for environmental education. NCEET also manages EE–Link (see page 38), an on-line resource for information on environmental education.

National Center for Appropriate Technology

PO Box 3838
Butte MT 59702-3838
406/494-4572
406/494-2905 fax

Develops and promotes practical, local solutions concerning energy, housing, agriculture, and the environment. Help for educators includes basic energy education information for all grade levels as well as practical, technical advice for community projects.

National Energy Foundation

5160 Wiley Post Way, Suite 200
Salt Lake City UT 84116
801/539-1406
800/616-TEAM for TEAMS info (see below)

A nonprofit educational organization that develops and distributes a variety of affordable teaching kits, lesson plans, posters, and other materials for K-12 educators. Topics include energy, water, mineral resources, science, technology, conservation, and the environment. Conducts teacher training programs. Provides partnership opportunities for corporations and government agencies. Sponsors the TEAMS Program (Total Energy Action Management in Schools, involving Teacher, Engineer, Administrator, and Management working with Students). The program encourages middle school students to consult with energy experts and write an energy efficiency policy for their school, with recommendations and actions for change. Policies are entered in a competition. Awards include participation in the U.S. delegation to the World Energy Conference.

National Network of Energy and Environmental Education Professionals

404 North State Street
Champaign IL 61820
217/359-9442

A networking organization of educators, business, and government agencies concerned about energy/environmental education and education reform. Makes connections among members to promote curriculum development, program marketing, and evaluation. Publishes *Network News*, including reviews of new materials, regional updates, and activity ideas. Sponsors annual networking conference.

National Science Teachers Association

1840 Wilson Boulevard
Arlington VA 22201-3000
800/722-NSTA
703–243-7177 fax

A membership organization providing a wide variety of services, including listings of science education suppliers and standard-setting. Publications include the magazines *Science and Children* (for teachers of grades K-8) and *Science Scope* (grades 5-9). Offers teacher training institutes, seminars, and conferences. New publications emphasize curriculum innovations, many of which are useful in nonformal settings.

New York Science, Technology, and Society Education Project

89 Washington Avenue, Room 228
Albany NY 12234
518/486-1726

Offers low-cost classroom materials and workshops for K-12 teachers, with suggestions for infusion into the New York curriculum. Activity collections include *Energy and Safety* (for K-6), *Renewable Energy, Nuclear Energy, Energy Conservation,* and *Fossil Fuels.* A new middle school publication *Energy and Physical Systems: How Do They Impact Our Lives?* stresses cooperative learning and critical thinking.

North Carolina Alternative Energy Corporation

PO Box 12699
Research Triangle Park NC 27709
919/361-9000

A nonprofit corporation promoting alternative ways of using and producing energy in North Carolina. Has developed a kit and plans for the Energy Cycle, a demonstration that teaches about electricity, energy transformations, and efficiency using a generator powered by a bicycle. The project offers potential for youth leadership in community education.

Rocky Mountain Institute

139 Snowmass Creek Road
Old Snowmass CO 81654
303/927-3851
303/927-4178 fax

A nonprofit research and education foundation promoting efficient, sustainable use of resources. Energy policy is a primary focus. Does not offer specific resources for youth education, but some pamphlets and fact sheets may be helpful in work with older youth.

Tennessee Valley Authority

Land Between the Lakes
100 Van Morgan Drive
Golden Pond KY 42211
502/924-1325

Offers a variety of energy and environmental education resources, including workshops for educators. The *Energy Education Sourcebook* (for grades K-12 in four volumes, each $35.00) offers background information and dozens of classroom activities covering electricity, energy sources (hydro, coal, nuclear, solar, wind, biomass, and conservation), energy in the environment, and energy in the Tennessee River Valley.

U.S. Department of Energy

This federal agency is home to a wide array of administrations, offices, national laboratories, and centers, in locations across the country. Many offer educational programs and materials for formal and nonformal education. Two offices specialize in helping the public find their way quickly to helpful resources:

U.S. Department of Energy
National Energy Information Center, EI–231
Energy Information Administration
1000 Independence Avenue SW
Washington DC 20585
202/586-8800
202/586-1181 (TDD)

U.S. Department of Energy
Department of Public Inquiries, PA–5
Office of Public Affairs
1000 Independence Avenue SW
Washington DC 20585
202/586-5575

Education program catalogs and other useful information for teachers and students, from kindergarten through graduate study, are available by writing:

U.S. Department of Energy
Office of Scientific and Technical Information
PO Box 62
Oak Ridge TN 37831-9939

For additional Department of Energy resources, see also:

Energy Efficiency and Renewable Energy Clearinghouse (page 41)

U.S. Department of Agriculture Extension Service/ 4-H Youth Development

South Building, Room 3860
Washington DC 20250-0900
202/720-5853

4-H is the youth development program of the U.S. Department of Agriculture's Extension Service. Each state has a Cooperative Extension/4-H office at its land grant university. The National 4-H Council is a private, nonprofit organization whose mission is to promote and enhance 4-H programs across the country.

The following state 4-H offices asked to be included in this Guide as resources for environmental stewardship program planning. States marked with an asterisk (*) below have youth energy education programs known to this review effort. Many of these may soon be available nationally through the *National Collection of 4-H Curricula.* If your state is not listed below, 4-H may still be a resource for you. If you are not familiar with Cooperative Extension/4-H in your state, call the National 4-H Council at 301/961-2913 for a contact name and address.

Alabama

Tony Dozier
214 Duncan Hall ACES
Auburn University AL 36849
205/844-2235
205/844-9650 fax

Alaska

Richard Seifert, Energy Specialist
UAF Cooperative Extension
Fairbanks AK 99775-6180
907/474-7201
907/474-5139 fax
FFRDS@aurora.alaska.edu

Arkansas*

Mike Klumpp, 4-H Program Specialist
Arkansas 4-H Center
No. 1 Four-H Way
Little Rock AR 72211
501/821-4444
501/821-2545 fax
fplafcan@uaex.arknet.edu
(Attn: Mike Klumpp)

Colorado

Al Meier
129 Aylesworth Hall
Colorado State University
Fort Collins CO 80523
303/491-6421
303/491-0521 fax

Connecticut*

Barbara Ladabouche
Cooperative Extension System
139 Wolf Den Road
Brooklyn CT 06234
203/774-9600
203/774-9480 fax
bladabou@canrl.cag.uconn.edu

Florida*

Craig Miller
PO Box 110520
Gainesville FL 32611-0520
904/392-1744
904/392-5184 fax
fourh@gnv.ifas.ufl.edu

Georgia*

Richard Osorio
Rock Eagle 4-H Center
350 Rock Eagle Road NW
Eatonton GA 31024
706/485-2831
706/485-2191 fax
rosorio@uga.cc.uga.edu

Guam

Allan Searle
University of Guam
CALS UOG 4H
Mangilao GU 96923
671/734-4753
671/734-6842 fax
cals.uog@uog.pacific.edu attn: Searle

Hawaii

Carl Evensen, Extension Specialist, Natural Resources
Department of Agronomy & Soil Science
University of Hawaii – Manoa
1910 East-West Road
Honolulu HI 96822
808/956-7530
808/956-6539 fax

Idaho*

University of Idaho Cooperative Extension
State 4-H Office, 103 Morrill Hall
Moscow ID 83844-3015
208/885-6321
208/885-6198 fax
4Hspec@idvi1.csrv.vidaho.edu

Indiana

State 4-H Office
1161 AG AD Building
Purdue University
West Lafayette IN 49907-1161
317/494-8422
317/496-1152 fax

Iowa*

Judy Levings
Youth and 4-H
33 Curtis Hall
Iowa State University
Ames, IA 50011
515/294-4764
515/294-1047 fax
jleving@ia.state.exnet.edu

Louisiana*

Dr. Debra Acosta, Extension Associate (Energy)
PO Box 25100
Baton Rouge LA 70894–5100
504/388-2229
504/388-2478 fax

Maine

Catherine A. Elliott
Extension Wildlife and Environmental Education Specialist
5755 Nutting Hall, University of Maine
Orono ME 04469-5755
207/581-2902
207/581-3466 fax
celliott@umce.umext.maine.edu

Massachusetts

Tom Waskiewicz
Cooperative Extension/4-H Youth Development
214 Stockbridge Hall
University of Massachusetts
Amherst MA 01003
413/545-2646
413/545-6555 fax
twaskiewicz@coopext.umass.edu

Minnesota

Stephen P. Carlson, Ph.D.
340 Coffey Hall
1420 Eckles Avenue
St. Paul MN 55108
612/626-1259
616/625-1731 fax
scarlson1@mes.umn.edu

Mississippi*

Dr. Rae Wilkinson
State 4-H Department
Box 9641
Mississippi State MS 39762
601/325-3350
601/325-5207 fax
raew@mces.msstate.edu

Missouri*

Barbara K. Brown
Missouri 4-H Youth Development Program
212 Whitten Hall
University of Missouri – Columbia
Columbia MO 65211
314/882-8807
314/884-4225 fax
brown.b@ext.missouri.edu

New Jersey

Laura Bovitz
Middlesex County Extension
390 George Street, 8th floor
New Brunswick NJ 08901
908/745-3446
908/745-3478 fax

New Mexico*

Dr. Susan Wright
Box 3AE
Las Cruces NM 88003
505/646-3306
505/646-5975 fax
swright@nmsu.edu

New York*

David Gross
340 Roberts Hall
Cornell University
Ithaca NY 14853-4203
607/255-3132
607/255-0788 fax

North Carolina*

Clare-Marie Hannon
4-H Center
809 Cedar Lane
Reidsville NC 27320
910/349-9445
910/634-0110 fax
channon@wolf.ces.ncsu.edu

Ohio

Dennis L. Elliott
2120 Fyffe Road
Columbus OH 43210
614/292-6942
614/292-5937
Elliott@agvax2.ag.ohio–state.edu

Oklahoma*

Charles Cox
Oklahoma 4-H Programs
205 Poultry Science
Oklahoma State University
Stillwater OK 74078-0330
405/744-5391
405/744-6222 fax

South Carolina

Bob Spaulding
Extension Family & Youth Development
243 Poole Agriculture Center
Box 340135 Clemson University
Clemson, SC 29634-0315
803/656-3420
803/656-5723 fax
bspldng@clust1.clemson.edu

Utah*

Scott S. McKendrick, State 4-H Program Leader
Utah State University
Logan UT 84322-4900
801/797-2203
801/797-3268 fax
scott@ext.usu.edu

Virginia*

Robert Ray Meadows
119 Hutcheson Hall
Virginia Tech
Blacksburg VA 24061
703/231-6371
703/231-7866 fax
bmeadows@vtvm1.cc.vt.edu

Washington*

Jerry Newman
WSU – 4-H Youth Development
Hulbert Hall 323C
Pullman WA 99164-6236
509/335-2800
509/335-2808 fax
newmanj@wsuvmi.csc.wsu.edu

Accessing the 4-H Energy Education Resources Database

THE 4-H ENERGY EDUCATION RESOURCES DATABASE is an electronic repository for information about energy/environmental education resources. It can be accessed via the Internet, or by calling the University of Massachusetts computer center directly with a computer and modem.

The process is simple, but menu numbers often change as new services are added, so some instructions below are necessarily general. Wording of items in quotation marks may not be exact.

Preparing to use the electronic database

First, set your software for vt100 terminal emulation, and 8N1 (8 bits, no parity, one stop bit).

Getting to UMassK12

Each option below will bring up a screen that includes the UMassK12 gopher as a menu item.

Connecting via Internet

- If you have Internet access locally, log into your account and enter:

  ```
  gopher k12.ucs.umass.edu
  ```

- If you access gopher via a menu, select the menu item

  ```
  "other gopher services"
  ```

  or something similar. Then look for a route to the University of Massachusetts/Amherst gopher. You will probably see North America, then USA, then Massachusetts. Then look for other UMass gophers, probably under

  ```
  "More Gophers and Other
   Internet Services."
  ```

- If you have access to telnet but not to a gopher, enter:

  ```
  telnet k12.ucs.umass.edu
  ```

At the login prompt, enter (in lower case letters):

```
guest
```

Connecting via telephone call to the University of Massachusetts

Dial 413/545–3700. You will get a menu.

Select:

```
Connect ?
```

This will give you a prompt

```
Connect ?...
```

Now enter

```
k12.ucs.umass.edu
```

At the login prompt, enter (in lower case letters):

```
guest
```

Using the database

Once you have reached the UMassK12 gopher, look for the menu item:

```
4H Energy Education Resources
```

Select this item. You will now see a list of resources, including

```
About the 4H Energy Education Resources Database

Text of Educating Young People About Energy for Environmental Stewardship

Text of the Report to 4-H on Opportunities for Future Involvement in Energy Education for Environmental Stewardship

4H Energy Education Resources Database

Search the 4H Energy Education Resources Database <?>
```

If you select one of these items, you will be able to read it and/or retrieve all or part of it. For full information on these files, start with the menu choice:

```
About the 4H Energy Education Resources Database
```

If you select the menu choice:

```
Search the 4H Energy Education Resources Database <?>
```

you will be prompted:

```
"Words to search for"
```

Enter one or a few key words. The program will locate those energy/environmental education resources that contain the words together or close to each other. The program does not recognize synonyms or alternate word forms. Thus "car" and "cars" are different words, as are "Indians" and "Native Americans."

The help function tells how to save or e-mail specific items from the database. If you would like to retrieve the whole text or database, choose the appropriate menu item.

BEST COPY AVAILABLE

The 1994 4-H Energy Education Assessment

THIS PRINTED GUIDE, its accompanying electronic database, and a brief *Report to 4-H* are the result of the 1994 Energy Education Assessment, sponsored by the National 4-H Environmental Stewardship Program.

This project has been a team effort, with University of Massachusetts Cooperative Extension providing leadership. Project partners include National 4-H Council, U.S. Department of Agriculture-Extension Service, and Amoco Foundation, Inc.

A national review team representing diverse energy concerns, interests, and perspectives met in February 1994 to shape the assessment's goals and review criteria. The team included scientists, educators, environmental advocates, and representatives from government, business, and industry.

A team of educators with experience in formal and nonformal education in energy, science, social studies, youth development, and the environment conducted the actual review, reading materials and completing review forms through the spring. A specially recruited group of K-12 teachers and 4-H leaders spent a day with this team at the beginning of the review to refine the process and ensure a broad perspective.

A *Report to 4-H on Opportunities for Future Involvement in Energy Education for Environmental Stewardship* was prepared as part of this project. The report looks at the landscape of existing resources, trends, and opportunities in the field of education, notes emerging issues in energy and the environment, and recommends a continued role for 4-H. It is available via the 4-H Energy Education Resources Database and from the National 4-H Council.

National Review Team

Kasse Andrews-Weller, Office of University and Science Education, U.S. Department of Energy

Pamela Calhoun, Energy Education, University of Nevada

Kashyap Choksi, National 4-H Council

Bonnie Cornwall, California Energy Extension Service

Gregory Crosby, Cooperative Extension/ 4-H, U.S. Department of Agriculture

JoAnn Emmel, College of Agriculture and Home Economics, New Mexico State University

Charles Evans, U.S. Environmental Protection Agency

Ted Field, American Forests

April Gower–Getz, National 4-H Council

Susan Halbert, National 4-H Council

Nan Kemp, Environmental Research, Amoco Production Company

Elizabeth Kraft, League of Women Voters

David LaHart, Institute of Science and Public Affairs, Florida State University

Jim Masker, National Center for Appropriate Technology

Craig Miller, Cooperative Extension/4-H, University of Florida

Mike Nelson, Washington Energy Education Service

Terry Ross, Center for Energy and Economic Development

Charles Roth, D.C. Heath

Bob Schrader, University of Massachusetts Cooperative Extension

Morton Sternheim, Department of Physics, University of Massachusetts

Henry Sullivan, Appalachian Power

Carol Timms, National Network of Energy and Environmental Education Professionals

Curriculum Reviewers

Beth Bazler, Northeast Utilities

Millie Gedrites, University of Massachusetts Cooperative Extension/4-H Youth Development

Bonnie Knopf, 4-H Volunteer, Environmental Stewardship Educator

Peg McDaniel, Hitchcock Center for the Environment

Barbara Waters, University of Massachusetts Cooperative Extension

Mary Alice Wilson, Five Colleges, Inc.

Project Director

Will Snyder
4-H/Youth Development and Natural Resource Programs
Cooperative Extension
University of Massachusetts/Amherst

Project Support Staff

Laura Hall, Administrative Secretary

Sarah Shafiroff, Student Assistant

Jack Cavacco, Publication Designer

This publication may be copied and is available electronically. To obtain additional copies of this printed version, the *Report to 4-H*, or for more information on the 4-H Environmental Stewardship Program, contact:

Environmental Stewardship Program
National 4-H Council
7100 Connecticut Avenue
Chevy Chase MD 20815
301/961-2913.

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